GROUP 54D

CONTROLLER AREA NETWORK (CAN)

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GENERAL INFORMATION

M1548310000267

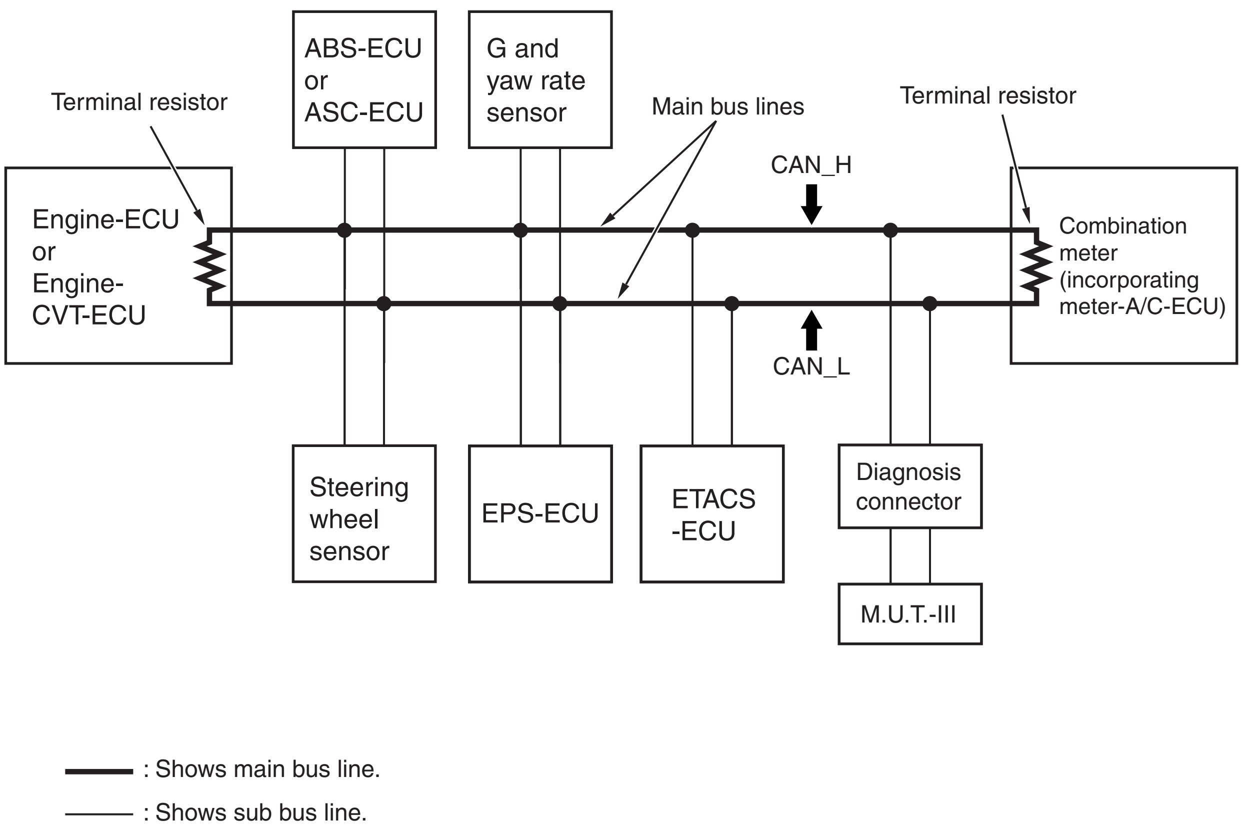
CAN, an abbreviation for Controller Area Network, is an ISO-certified international standard for a serial multiplex communication protocol*. A communication circuit employing the CAN protocol connects each ECU, and sensor data can be shared among, which enables more reduction in wiring.

*NOTE: *: The regulations have been decided in detail, from software matters such as the necessary transmission rate for communication, the system, data format, and communication timing control method to hardware matters such as the harness type and length and the resistance values.*

CAN offers the following advantages.

- Transmission rates are much faster than those in conventional communication (up to 1 Mbps), allowing much more data to be sent.
- It is exceptionally immune to noise, and the data obtained from each error detection device is more reliable.
- Each ECU connected via the CAN communicates independently, therefore if the ECU enters damaged mode, communications can be continued in some cases.

STRUCTURE



AC204755AF

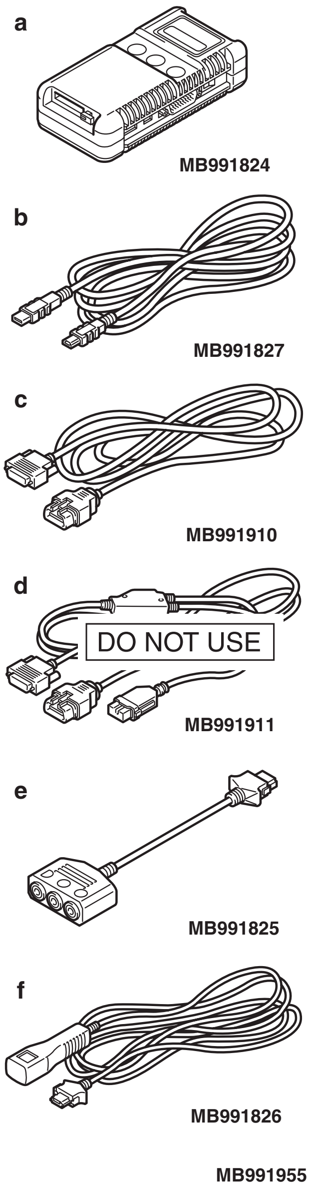
- The CAN bus line consists of two lines, CAN_L and CAN_H (CAN Low and CAN High, respectively), as well as two terminal resistors (A twisted-pair cable, highly resistant to noise, is used for the communications line).
- The CAN bus line connecting the two terminal resistors is the main bus line, and the CAN bus line connecting each ECU is the sub-bus line.
- The terminal resistors are installed in the engine-ECU <M/T> or engine-CVT-ECU <CVT> and combination meter (incorporating meter-A/C-ECU) to stabilize communication signals (The terminal resistance is set at approximately 120 Ω).
- ECUs are connected in the CAN bus line as follows.
  - Engine-ECU <M/T> or engine-CVT-ECU <CVT>

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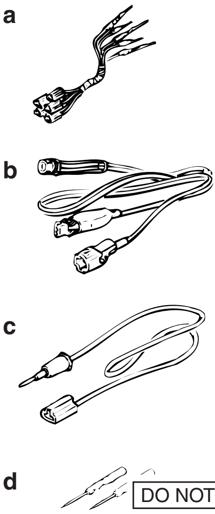
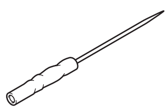
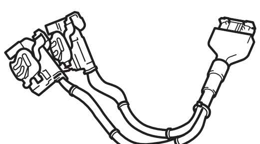
- ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC>
- G and yaw rate sensor <vehicles with ASC>
- Steering wheel sensor <vehicles with ASC>
- EPS-ECU
- ETACS-ECU
- Combination meter (incorporating meter-A/C-ECU)

SPECIAL TOOL

M1548304200369

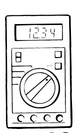
Tool	Number	Name	Use
	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V.C.I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** CAN bus diagnostics

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Tool	Number	Name	Use
	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester
	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector
	MB991974	ABS check harness	Checking continuity and measuring voltage at ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> harness-side connector

TEST EQUIPMENT

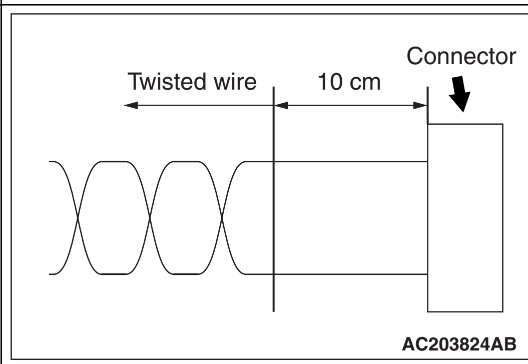
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Test equipment	Name	Use
	Digital multimeter	Checking CAN bus circuit (for resistance and voltage measurements)

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SERVICE PRECAUTIONS

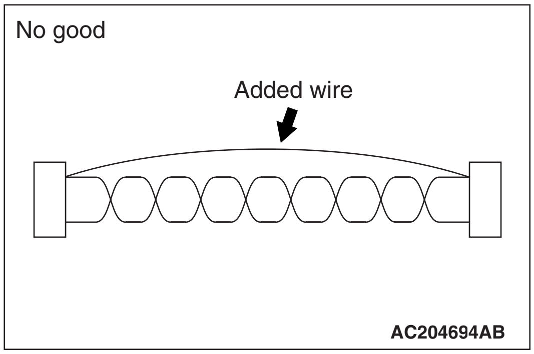
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Warnings in diagnosis section	Details regarding warnings
When servicing an CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.	–
⚠ CAUTION A digital multimeter should be used.	When measuring resistance value or voltage in CAN bus lines, use a digital multimeter. If not using a digital multimeter, the equipments, which are connected through the CAN communication lines, may be damaged.
⚠ CAUTION When measuring the resistance, disconnect the negative battery terminal.	Disconnect the negative battery terminal when measuring the resistance value in the CAN bus line. If you fail to do so, the equipments, which are connected through the CAN communication lines, may be damaged.
⚠ CAUTION The test wiring harness should be used.	Always use the test harness when measuring the voltage or resistance value at the female connector. If you fail to do so, connectors may be damaged.
⚠ CAUTION The strand end of the twist wire should be within 10 cm from the connector.	 If you repair the wire due to a defective connector or its terminal or harness wire, you should cut the wire so that the strand end of the twist wire should be within 10 cm from the connector as shown. If it exceeds 10 cm, twist the wiring harness just like the original twisted wire. If the strand end exceeds 10 cm (4.0 inches), a communication error may be caused.
⚠ CAUTION Strictly observe the specified wiring harness repair procedure.	When you repair a CAN bus line, observe the precautions on how to repair the CAN bus line strictly. Refer to P.54D-6. If a new wire is added or a splice point is modified for the CAN_L or CAN_H line, an error in the CAN communication may be caused.

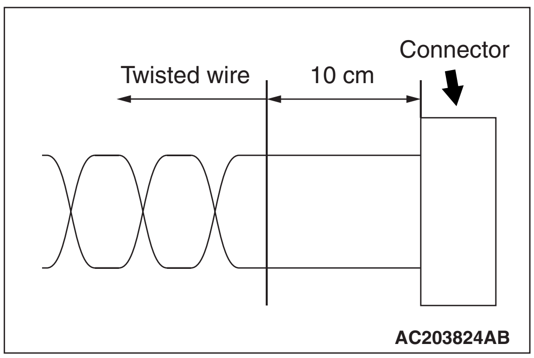
PRECAUTIONS ON HOW TO REPAIR THE CAN BUS LINES

M1548301900121

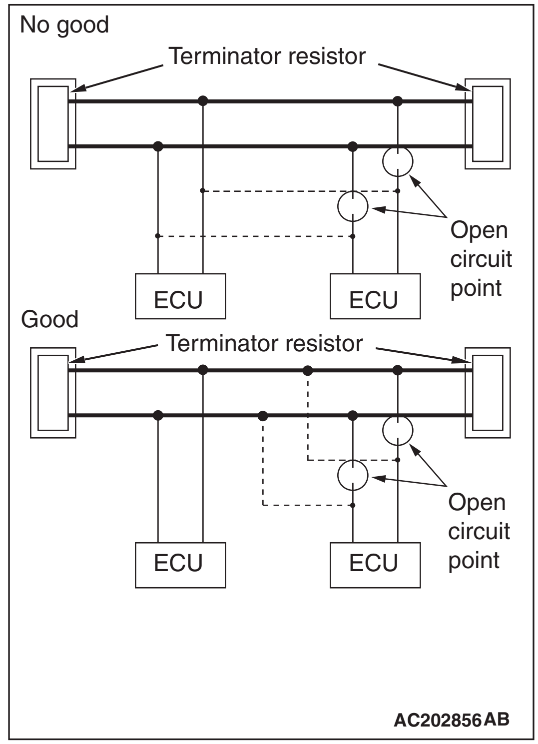
PRECAUTIONS ON HOW TO REPAIR THE CAN BUS LINES



- If the CAN bus line(s) are repaired, renew all the twisted wires between the end connectors. If the wiring harness is partially repaired, or only CAN_L or CAN_H line is repaired, noise suppression is deteriorated, causing a communication error.



- If the connector or wire on the main bus line or the sub-bus wire is replaced, the frayed end of the twisted wire should be within 10 cm from the connector. If it exceeds 10 cm, twist the wiring harness just like the original twisted wire. If the frayed end exceeds 10 cm, noise suppression is deteriorated, causing a communication error.



- If a sub-bus line is repaired, splice a new wire directly into the main bus line. If a new wire is spliced into the sub-bus line, which is connected to another device, the CAN communication will be disabled.

PRECAUTIONS ON HOW TO REPAIR THE TERMINATOR RESISTOR

If one-side terminator resistor is broken, the CAN communication will continue although noise suppression is deteriorated. No diagnosis codes may be set even if the terminator resistor was broken. If a damage is found, replace the ECU which incorporates the defective terminator resistor.

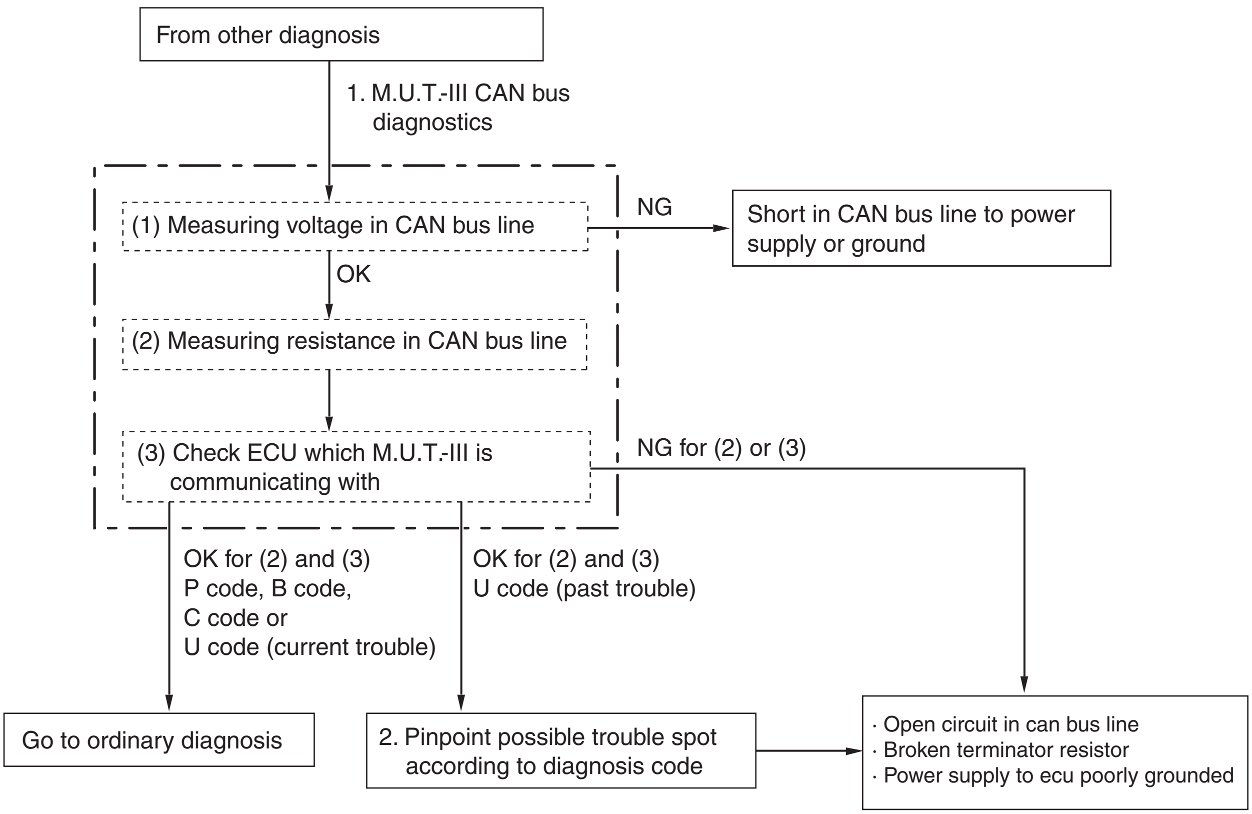
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EXPLANATION ABOUT THE M.U.T.-III CAN BUS DIAGNOSTICS

M1548300100393

The M.U.T.-III CAN bus diagnostics carries out the three checks below automatically, and then displays current condition of the CAN bus lines according to the check results.

CAN BUS LINE DIAGNOSTIC FLOW



AC204700AE

1. M.U.T.-III CAN bus diagnostics

   The M.U.T.-III diagnoses CAN bus lines in accordance with the following strategy.

   NOTE: When the M.U.T.-III carries out the voltage and resistance measurements, it will cease the communication between each of the ECU. If the M.U.T.-III can not cease the communication, it will carry out the voltage measurement.

(1) Measuring voltage in CAN bus line

Diagnoses the power supply (such as wires of higher voltage than CAN communication line) and earthing (such as wires of lower voltage than CAN communication line) of CAN bus lines for short circuit by measuring the voltages between the CAN_L line or H line and body earth.

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Terminal to be diagnosed	Normal value	Measurement value	Trouble when the measurement value does not meet the normal value	Note
Measuring the voltage between the CAN_L line and body earth	1.0 V or more and 4.0 V or less	Less than 1.0.	Short to earth of the CAN_L line	If the CAN_L or H line is shorted to earth or power supply, a diagnosis code may not be set.
		More than 4.0.	Short to power supply of the CAN_L line	
Measuring the voltage between the CAN_H line and body earth	1.0 V or more and 4.0 V or less	Less than 1.0.	Short to earth of the CAN_H line	
		More than 4.0.	Short to power supply of the CAN_H line	

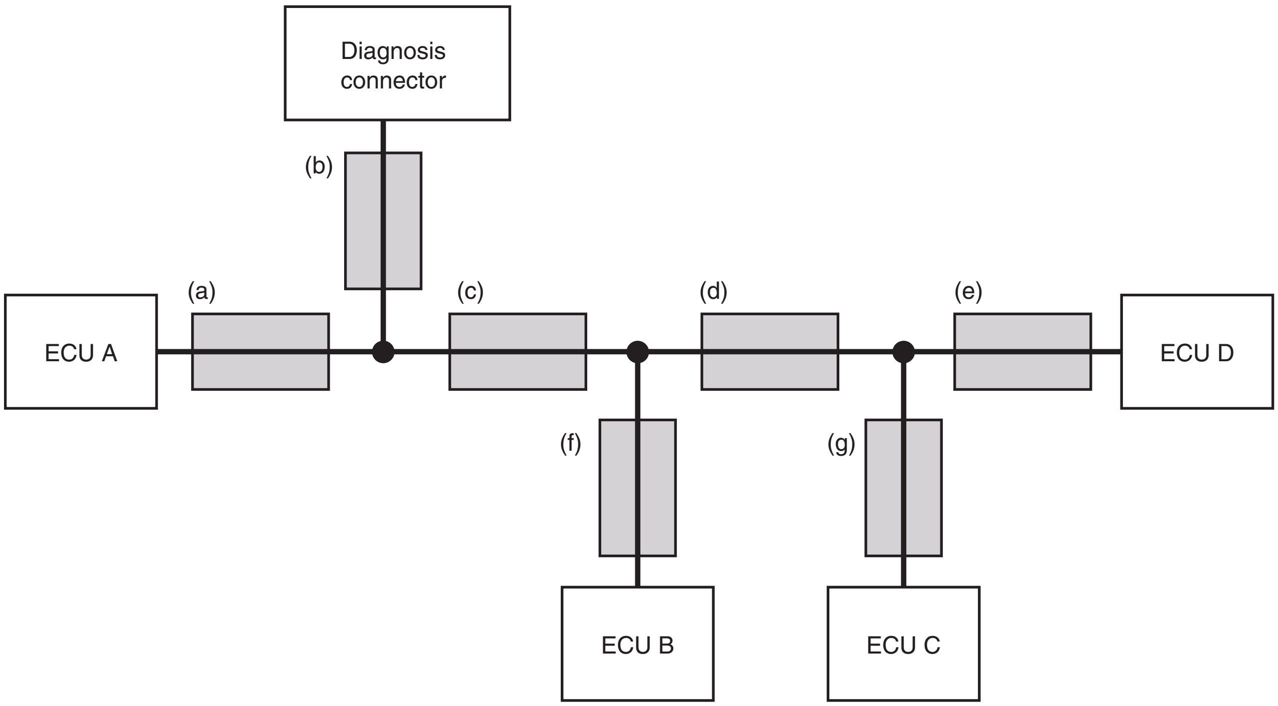
(2) Measuring resistance in CAN bus line
Checks the terminator resistors (incorporated in the combination meter or the engine-ECU <M/T> or engine-CVT-ECU <CVT>), which are connected to each end of a CAN bus line, for breakage and a CAN bus main line for open circuit by measuring the resistance value between a CAN_L line and H line.

Normal value	Measurement value	Trouble when the measurement value does not meet the normal value	Note
$60 \pm 10\ \Omega$	$120 \pm 20\ \Omega$	Trouble in a CAN main line or terminator resistor	If only one terminator resistor is broken at either side, the CAN communication will continue although noise suppression is deteriorated. If a CAN main bus line is open circuit, the CAN communication is suspended at that open circuit point.
	No continuity	Trouble in CAN main bus line or between the diagnosis connector and main bus line	–
	$2\ \Omega$ or less	CAN bus line (between CAN_L and H lines) is shorted	If a CAN bus line is shorted, all ECUs cease communicating each other (This fail-safe function is called "Bus off").
	Other than above	Poorly engaged connector	–

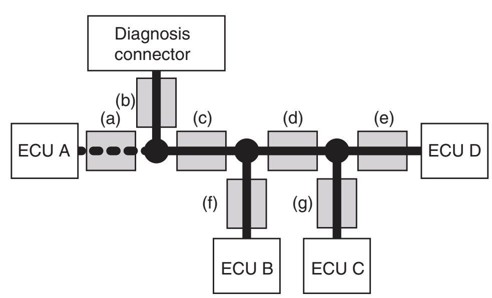
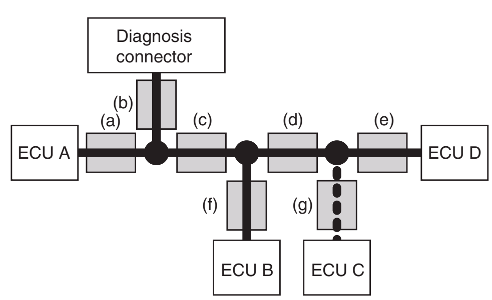
(3) Checking the communication condition of ECUs
The M.U.T.-III narrows down troubles in circuit by itself. Its strategy is as follows.

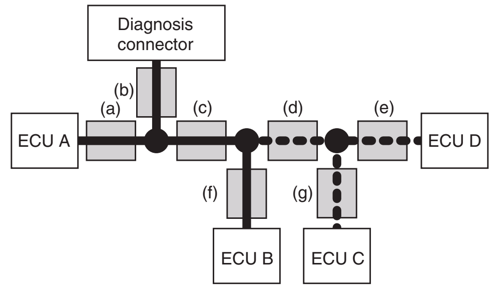
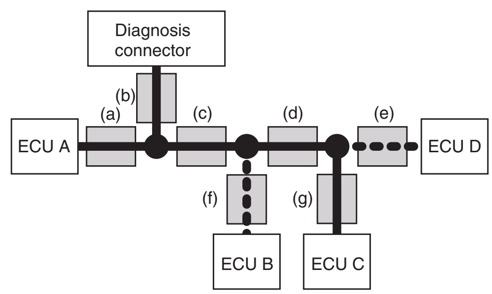
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Reference circuit



AC204741 AC

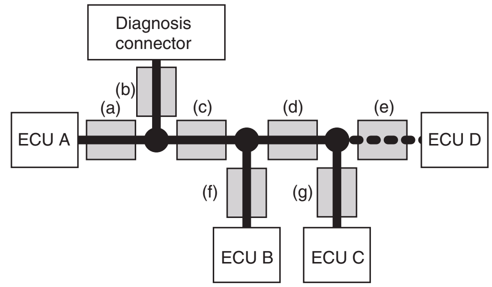
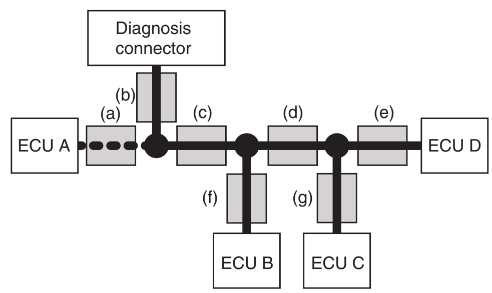
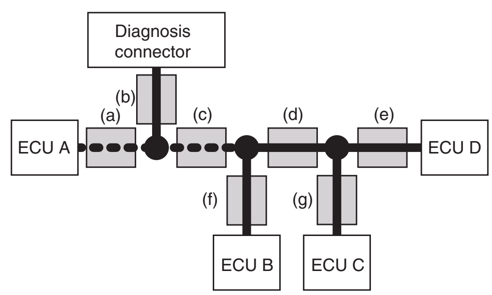
ECU which cannot communicate with the M.U.T.-III	Possible trouble spot	Logic for narrowing down trouble spot	
ECU.	CAN bus line (a) and power supply system to ECU.	ECU A communicates with the M.U.T.-III via CAN bus lines (a) and (b). The M.U.T.-III judges that CAN bus line (b) is normal, because it can communicate with other ECUs. Possible trouble may be present in CAN bus line (a) or the power supply system to ECU A.	 AC204742 AZ
ECU.	CAN bus line (g) and power supply system to ECU.	ECU C communicates with the M.U.T.-III via CAN bus lines (b), (c), (d) and (g). The M.U.T.-III judges that CAN bus lines (b), (c) and (d) are normal, because it can communicate with ECUs B and D. Possible trouble may be present in CAN bus line (g) or the power supply system to ECU C.	 AC204742 BA

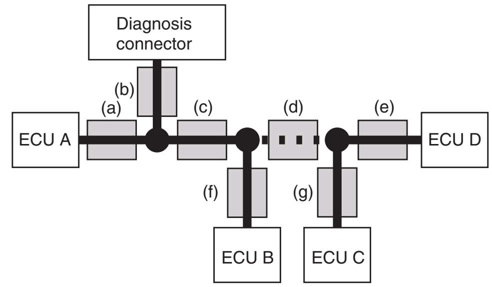
ECU which cannot communicate with the M.U.T.-III	Possible trouble spot	Logic for narrowing down trouble spot	
ECU C and ECU.	Trouble in CAN bus line (d)	ECUs C ad D communicate with the M.U.T.-III via CAN bus lines (b), (c), (d), (e) and (g). The M.U.T.-III judges that CAN bus lines (b) and (c) are normal, because it can communicate with ECU B. Possible trouble may be present in CAN bus line (d), (e) or (g) or the power supply system to ECU D. CAN bus line (d) is shared by ECUs C and D when they communicate with the M.U.T.-III, so CAN bus line (d) is suspected as ultimate cause. CAN bus line (g) or (e) and power supply systems to ECU C or D are also suspected as second cause.	 AC204742BB
ECU B and ECU.	CAN bus line (e) or (f) or power supply system to ECU B or.	ECUs C ad D communicate with the M.U.T.-III via CAN bus lines (b), (c), (d), (e) and (g). The M.U.T.-III judges that CAN bus lines (b), (c) and (d) are normal, because it can communicate with ECU C. Possible trouble may be present in CAN bus line (f) or (e) or the power supply system to ECU B or D.	 AC204742BC

2. If diagnosis code related to CAN communication is set as past trouble, isolate opens as described below.

   NOTE: If you pinpoint trouble spot according to diagnosis code, you should use time-out diagnosis code. diagnosis code related to failure information is set when the data to be set contains an error, so CAN bus line itself is probably normal.

   NOTE: Time-out diagnosis code codes are stored in each ECU memory individually. Therefore, it is possible that these diagnosis code codes have not been set simultaneously. If the trouble spot can not be found when you diagnose by judging from multiple diagnosis code codes, check the communication lines between each ECU.

Diagnosis code to be set	Possible trouble spot	Logic for narrowing down trouble spot	
Time-out diagnosis code associated with ECU D is stored in ECU A, ECU B and ECU.	Trouble in CAN bus line (e) and power supply system to ECU.	When time-out diagnosis code associated with ECU D is stored in ECU A, B and C, or time-out diagnosis code associated with ECUs A, B and C is stored in ECU D, or "Bus off" diagnosis code is stored in ECU D, CAN bus line (e) is suspected. When diagnosis code is not stored in ECU D, the power supply to ECU D is suspected.	 AC204742BD
Time-out diagnosis code associated with ECUs A, B and C is stored in ECU.			
"Bus off" diagnosis code is stored in ECU.			
Time-out diagnosis code associated with ECU A is stored in ECUs B, C and.	Trouble in CAN bus line (a) and power supply system to ECU.	When time-out diagnosis code associated with ECU A is stored in ECUs B, C and D, or time-out diagnosis code associated with ECUs B, C and D is stored in ECU A, or "Bus off" diagnosis code is stored in ECU A, CAN bus line (a) or (c) is suspected. When diagnosis code is not stored in ECU A, the power supply to ECU A is suspected.	 AC204742BE  AC204742BF
Time-out diagnosis code associated with ECUs B, C and D is stored in ECU.			
"Bus off" diagnosis code is stored in ECU.			

Diagnosis code to be set	Possible trouble spot	Logic for narrowing down trouble spot	
Time-out diagnosis code codes associated with ECUs C and D are stored in ECU A and ECU.	Trouble in CAN bus line (d)	If time-out diagnosis code codes associated with ECUs C and D are stored in ECUs A and B, or time-out codes associated with ECUs A and B are stored in ECUs C and D, CAN bus line (d) is suspected. CAN bus line (g) or (e) and power supply systems to ECU C or D are also suspected as second cause.	 AC204742BG
Time-out diagnosis code codes associated with ECUs A and B are stored in ECU C and ECU.			

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TROUBLESHOOTING

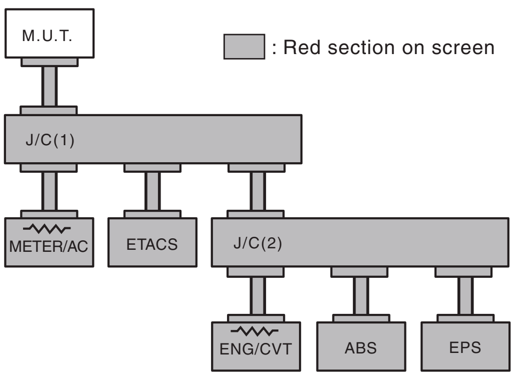
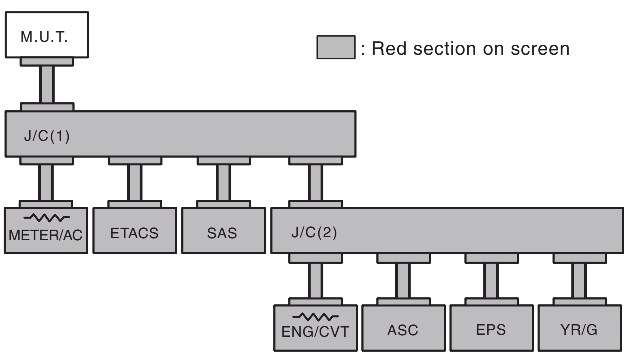
CAN BUS DIAGNOSTICS TABLE

M1548300200497

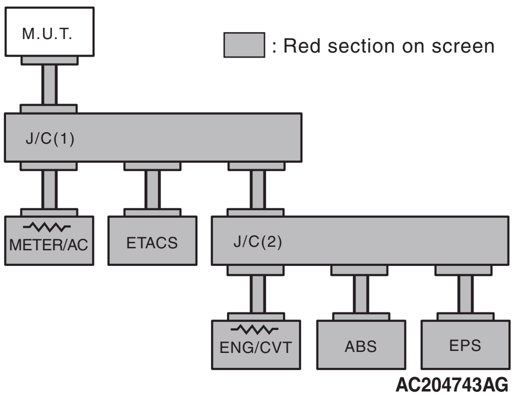
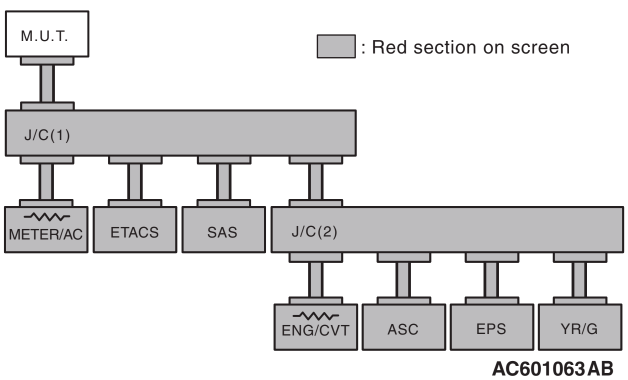
This diagnosis applies only to the CAN bus lines. If a different system is defective, proceed to the applicable diagnosis section for each system. Observe the diagnosis procedure below only when the CAN bus line is defective.

⚠ CAUTION

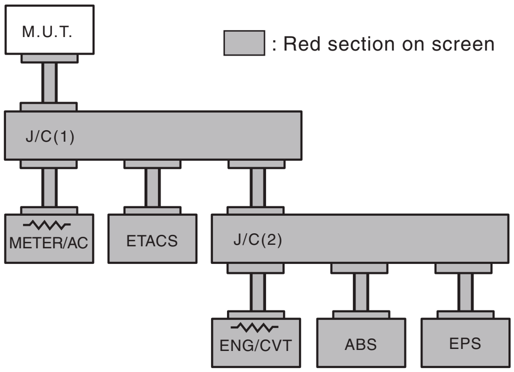
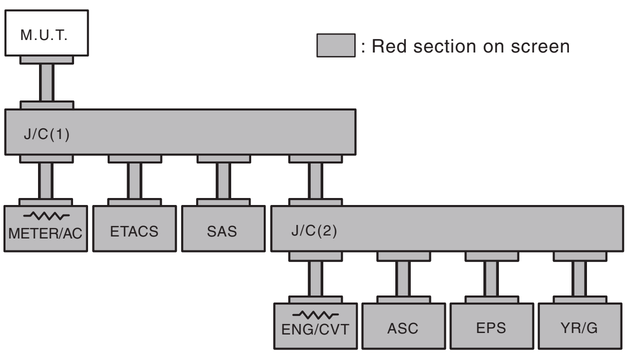
During diagnosis, a diagnosis code associated with another system may be set when the ignition switch is turned on with connector(s) disconnected. After completing the repair, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.

<table>
<tr><th>M.U.T.-III Screen</th><th>Comment</th><th>Diagnosis Detail</th><th>Reference Page</th></tr>
<tr><td><Vehicles without ASC>

AC204743AG</td><td rowspan="2">Short circuit to battery in red displayed area is estimated.</td><td rowspan="2">Diagnostic Item 1 Diagnose the CAN bus lines for short to power supply.</td><td rowspan="2">P.54D-24</td></tr>
<tr><td><Vehicles with ASC>

AC601063AB</td></tr>
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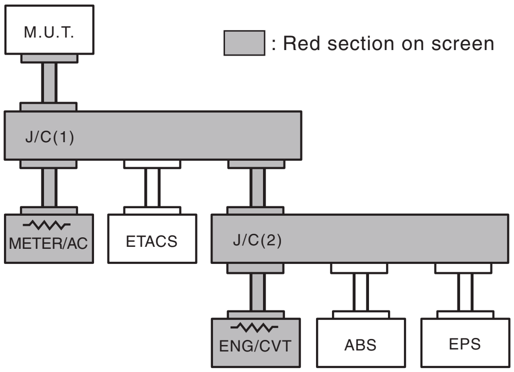
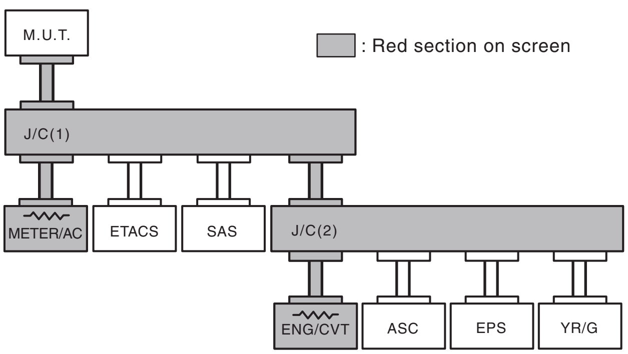
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M.U.T.-III Screen	Comment	Diagnosis Detail	Reference Page
<Vehicles without ASC>  <Vehicles with ASC> 	Grounding in red displayed area is estimated.	Diagnostic Item 2 Diagnose the CAN bus lines for short to earth.	P.54D-36

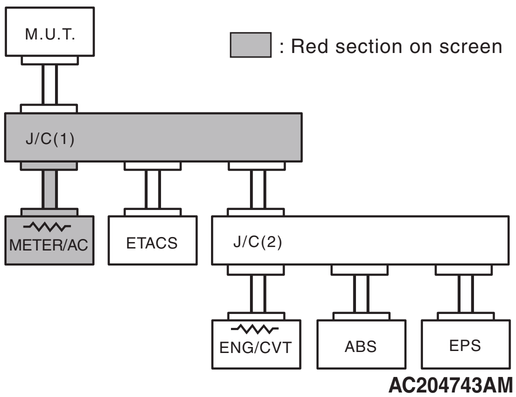
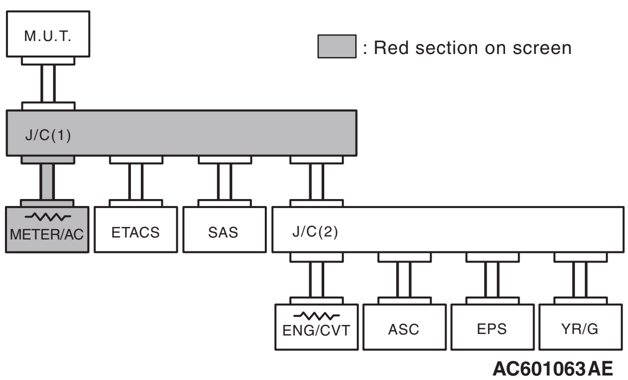
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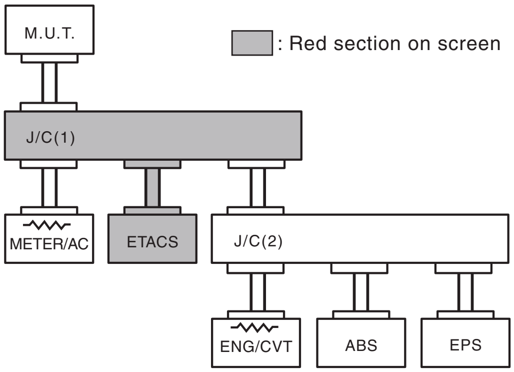
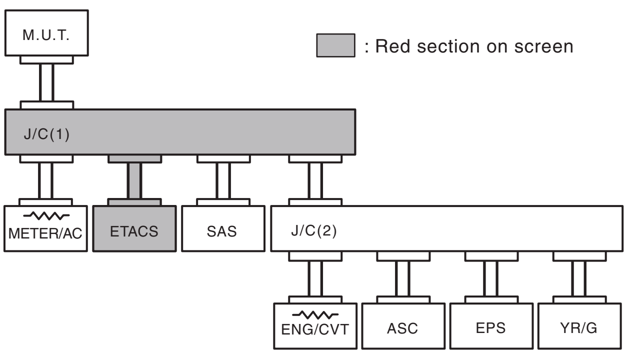
M.U.T.-III Screen	Comment	Diagnosis Detail	Reference Page
<Vehicles without ASC>  AC204743AG	Short circuit between CAN_H and CAN_L in red displayed area is estimated.	Diagnostic Item 3 Diagnose the lines between CAN_L and CAN_H for short circuit.	P.54D-48
<Vehicles with ASC>  AC601063AB			

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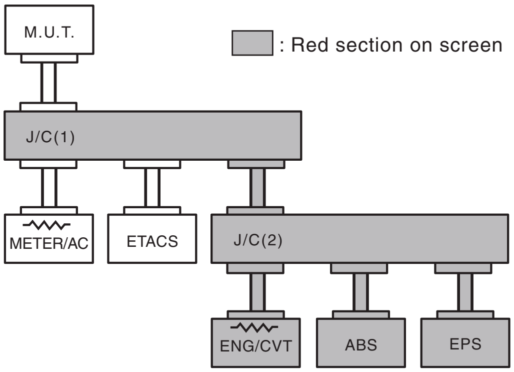
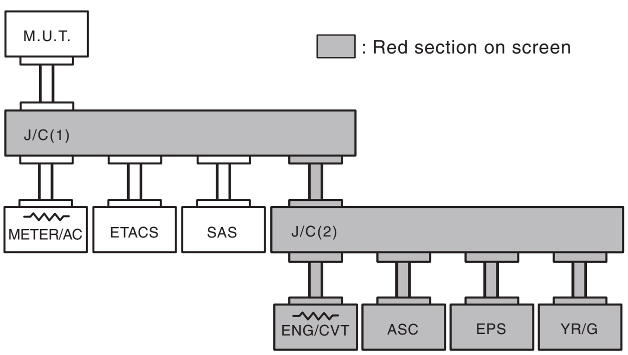
M.U.T.-III Screen	Comment	Diagnosis Detail	Reference Page
<Vehicles without ASC>  AC204743AF	Terminating resistance trouble is estimated.	Diagnostic Item 4 Diagnose the terminator resistors at both ends.	P.54D-56
<Vehicles with ASC>  AC601063AC			

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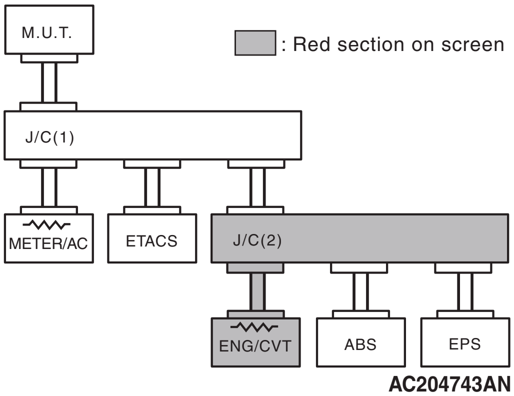
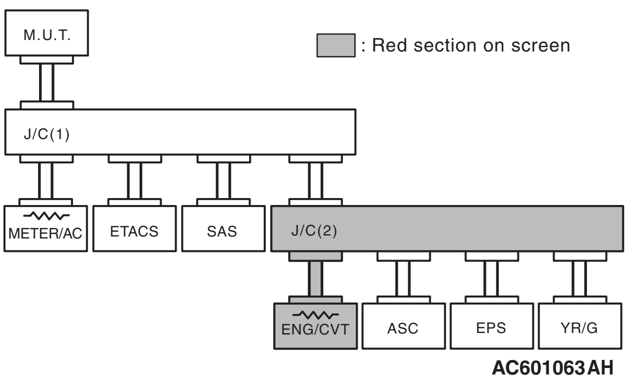
M.U.T.-III Screen	Comment	Diagnosis Detail	Reference Page
<Vehicles without ASC> 	Disconnection in red displayed area is estimated.	Diagnostic Item 5 Diagnose when the M.U.T.-III cannot receive the data sent by combination meter.	P.54D-58
<Vehicles with ASC> 			

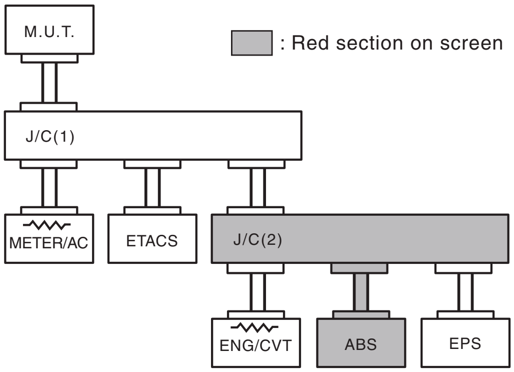
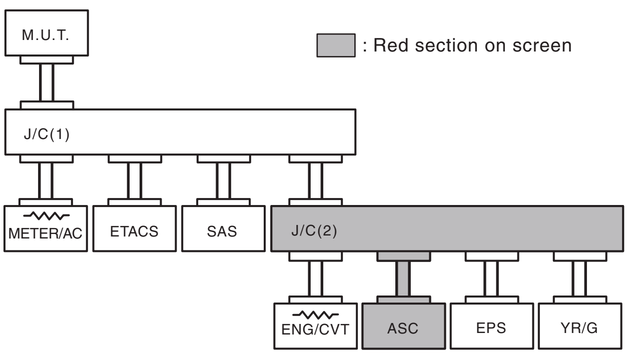
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<tr><th>M.U.T.-III Screen</th><th>Comment</th><th>Diagnosis Detail</th><th>Reference Page</th></tr>
<tr><td><Vehicles without ASC>

AC204743AJ</td><td rowspan="2">Disconnection in red displayed area is estimated.</td><td rowspan="2">Diagnostic Item 6
Diagnose when the M.U.T.-III cannot receive the data sent by ETACS-ECU.</td><td rowspan="2">P.54D-61</td></tr>
<tr><td><Vehicles with ASC>

AC601063AF</td></tr>
</table>

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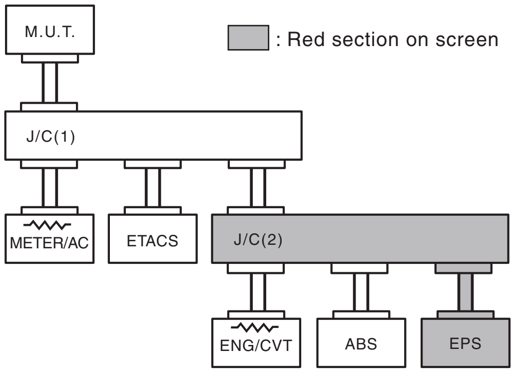
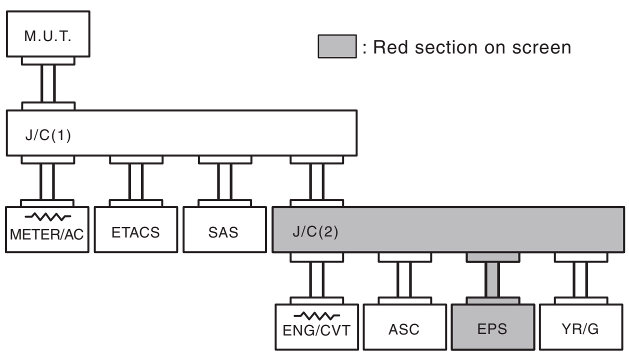
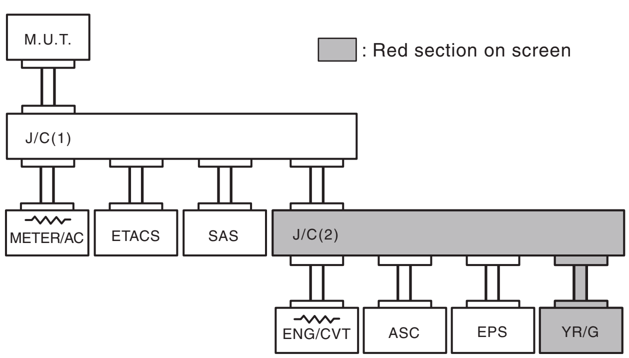
M.U.T.-III Screen	Comment	Diagnosis Detail	Reference Page
<Vehicles without ASC>  AC204743AO	Disconnection in red displayed area is estimated.	Diagnostic Item 7 Diagnose the lines between the joint connectors (CAN1 and CAN2).	P.54D-64
<Vehicles with ASC>  AC601063AG			

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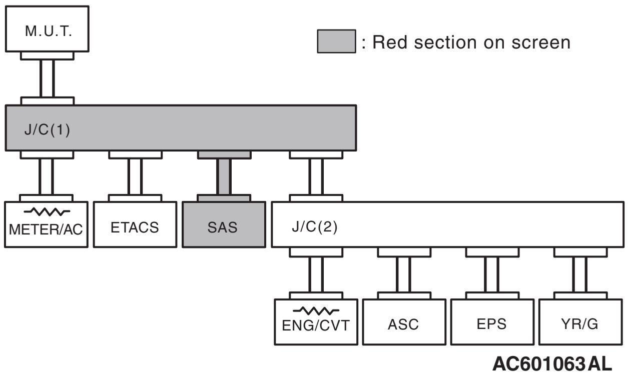
M.U.T.-III Screen	Comment	Diagnosis Detail	Reference Page
<Vehicles without ASC>  <Vehicles with ASC> 	Disconnection in red displayed area is estimated.	Diagnostic Item 8 Diagnose when the M.U.T.-III cannot receive the data sent by engine-ECU <M/T> or engine-CVT-ECU <CVT>.	P.54D-67

M.U.T.-III Screen	Comment	Diagnosis Detail	Reference Page
<Vehicles without ASC>  AC204743AH	Disconnection in red displayed area is estimated.	Diagnostic Item 9 Diagnose when the M.U.T.-III cannot receive the data sent by ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC>.	P.54D-71
<Vehicles with ASC>  AC601063AI			

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M.U.T.-III Screen	Comment	Diagnosis Detail	Reference Page
<Vehicles without ASC>  AC204743AI	Disconnection in red displayed area is estimated.	Diagnostic Item 10 Diagnose when the M.U.T.-III cannot receive the data sent by EPS-ECU.	P.54D-75
<Vehicles with ASC>  AC601063AJ			
<Vehicles without ASC>  AC601063AK	Disconnection in red displayed area is estimated.	Diagnostic Item 11 Diagnose when the M.U.T.-III cannot receive the data sent by G and yaw rate sensor.	P.54D-78

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M.U.T.-III Screen	Comment	Diagnosis Detail	Reference Page
<Vehicles without ASC> 	Disconnection in red displayed area is estimated.	Diagnostic Item 12 Diagnose when the M.U.T.-III cannot receive the data sent by steering wheel sensor.	P.54D-81

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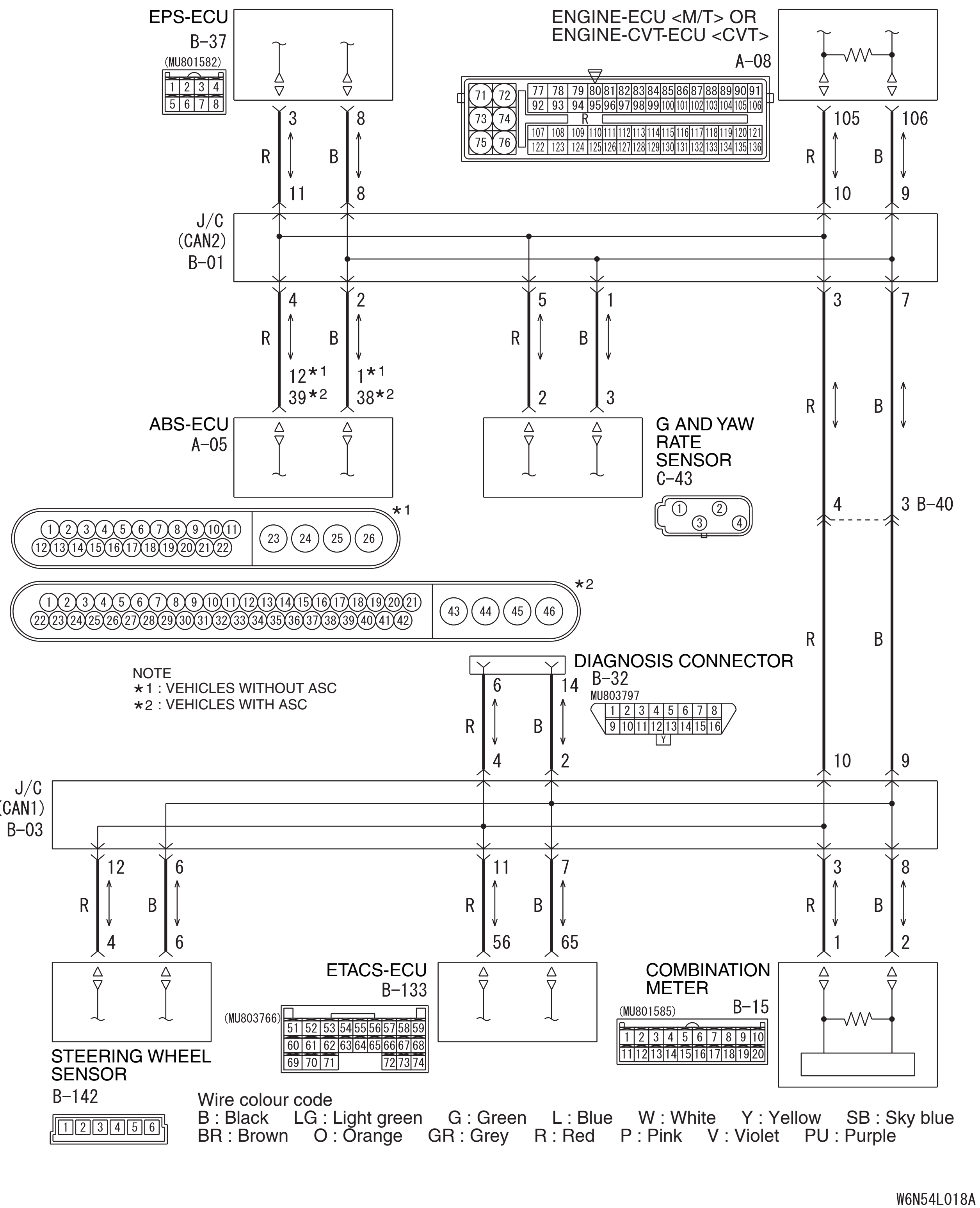
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CAN BUS DIAGNOSIS

Diagnostic Item 1: Diagnose the CAN bus lines for short to power supply.

⚠ **CAUTION**

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



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FUNCTION

When diagnosing the CAN bus lines, the M.U.T.-III measures the voltage of CAN_H and CAN_L line and detects the short to power supply or earth.

TROUBLE JUDGEMENT CONDITIONS

The M.U.T.-III judges the trouble when it is impossible to receive the periodically sent data and the voltage of CAN_H or CAN_L line is more than 4.0 volts.

POSSIBLE CAUSES

- Malfunction of the wiring harness
- Malfunction of the connector
- Malfunction of each ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the CAN bus lines. Voltage measurement at B-32 diagnosis connector.

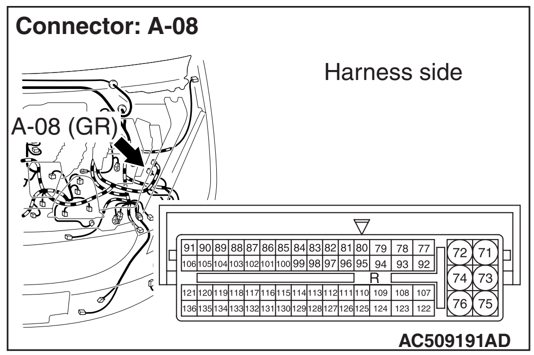
⚠ CAUTION

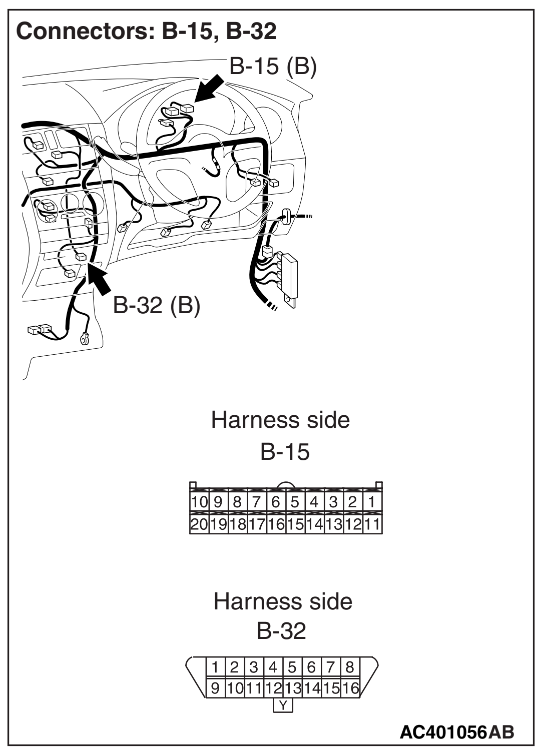
A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.

NOTE: This inspection allows you to check that there is a short to power supply in either CAN_H line or CAN_L line. Thus, in the following steps, check the CAN bus line that is defective.

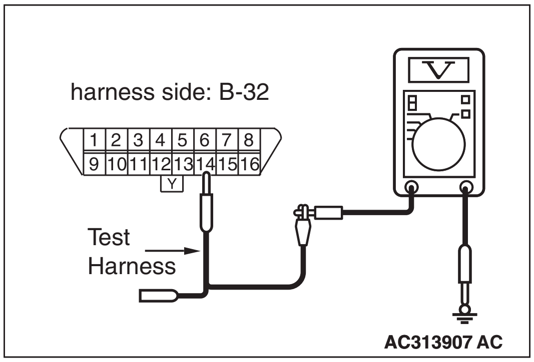




(1) Disconnect engine-ECU <M/T> or engine-CVT-ECU <CVT> connector A-08 and combination meter connector B-15, and measure the voltage at the harness side of diagnosis connector B-32.

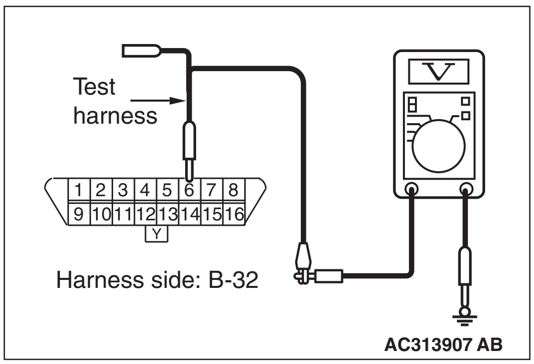
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(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



(3) Voltage between B-32 diagnosis connector terminal No.14 and body earth (CAN_H)

OK: 4.0 V or less



(4) Voltage between B-32 diagnosis connector terminal No.6 and body earth (CAN_L)

OK: 4.0 V or less

(5) Disconnect the negative battery terminal.

Q: Is the check result normal?

YES : <Both of the measurement results show 4.0 V or less> Go to Step 10.

NO : <Either of CAN_H line or CAN_L line the measurement results show 4.0 V or less> Go to Step 2.

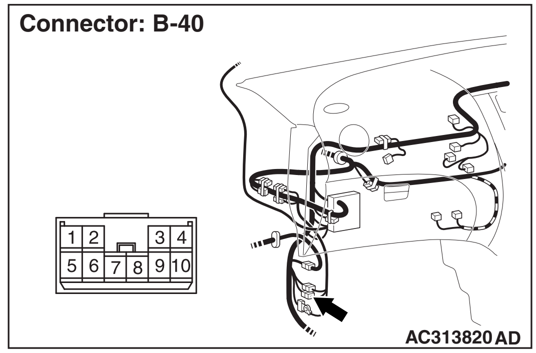
STEP 2. Voltage measurement at B-40 intermediate connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

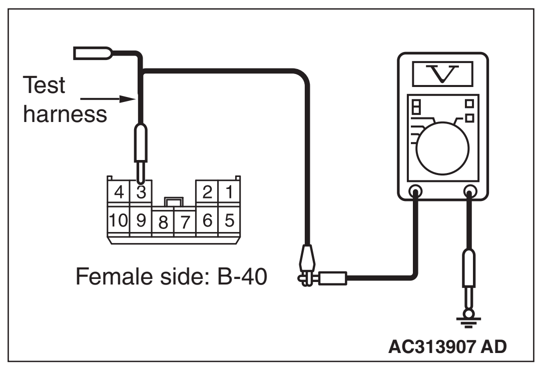
⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.



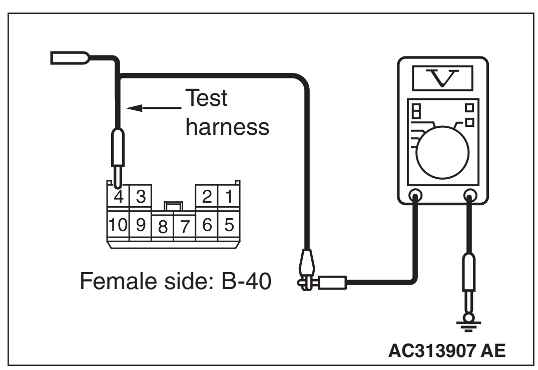
(1) Disconnect intermediate connector (B-40), and measure at its female-side intermediate connector (at the front wiring harness side).

(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



(3) Voltage between B-40 intermediate connector terminal No.3 and body earth (CAN_H)

OK: 4.0 V or less



(4) Voltage between B-40 intermediate connector terminal No.4 and body earth (CAN_L)

OK: 4.0 V or less

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(5) Disconnect the negative battery terminal.

Q: Is the check result normal?

YES : <4.0 V or less> Go to Step 7.

NO : <more than 4.0 V> Go to Step 3.

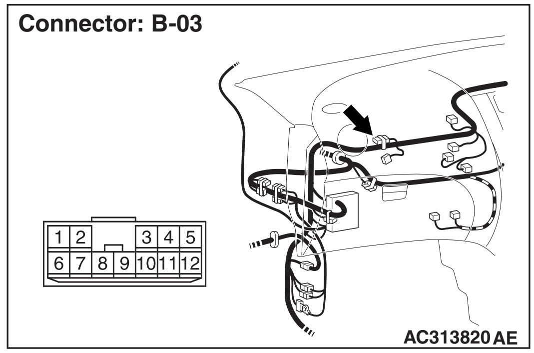
STEP 3. Resistance measurement at B-03 joint connector (CAN1).

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

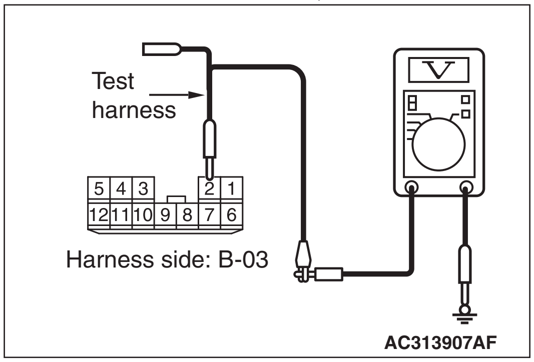
The test wiring harness should be used. For details refer to P.54D-5.



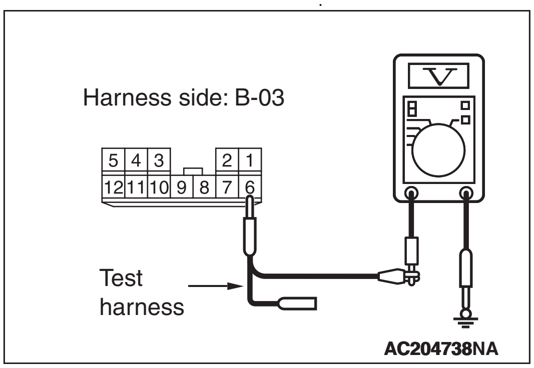
(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.
(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.
(3) Measure the voltage between each of B-03 joint connector (CAN1) terminals and body earth.

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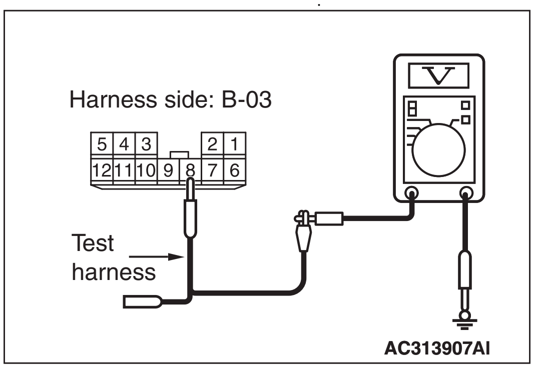
<CAN_H>



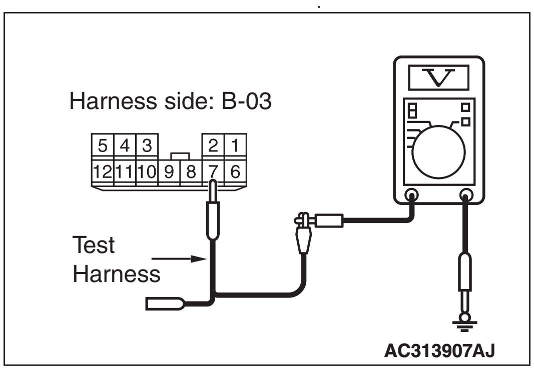
Terminal No.2 and body earth



Terminal No.6 and body earth <vehicles with ASC>



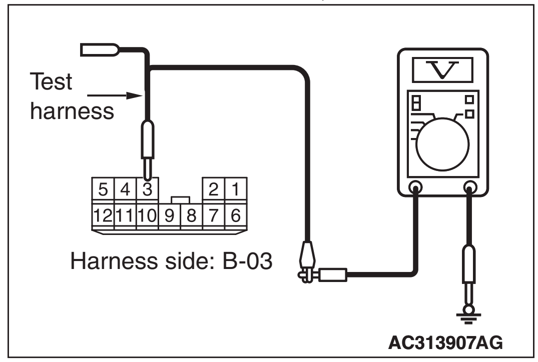
Terminal No.8 and body earth



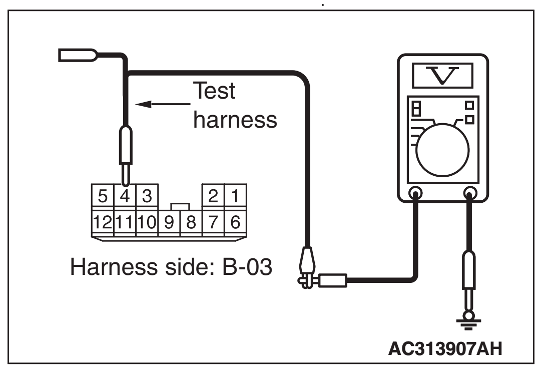
Terminal No.7 and body earth

OK: 4.0 V or less

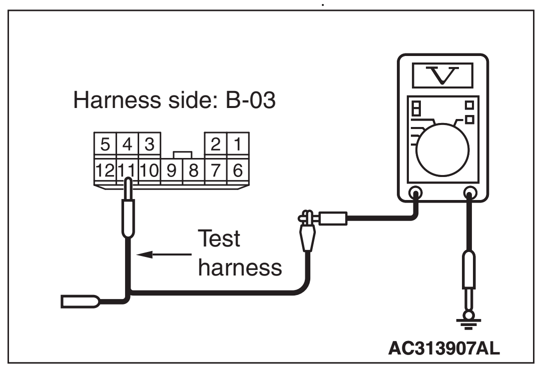
<CAN_L>



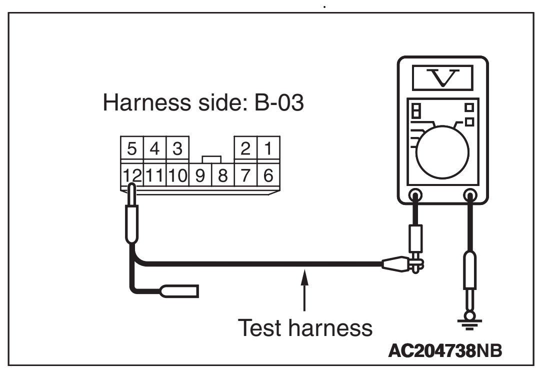
Terminal No.3 and body earth



Terminal No.4 and body earth



Terminal No.11 and body earth



Terminal No.12 and body earth <vehicles with ASC>

OK: 4.0 V or less

(4) Disconnect the negative battery terminal.

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Q: Is the check result normal?

YES <all of the measurement results show 4.0 V or less> : Repair the wiring harness between joint connector (CAN1) and intermediate connector (B-40).

NO <The voltage between terminal No.2 or 4 and body earth is more than 4.0 V> : Repair the wiring harness between joint connector (CAN1) and diagnosis connector.

NO <The voltage between terminal No.3 or 8 and body earth is more than 4.0 V> : Repair the wiring harness between joint connector (CAN1) and combination meter connector.

NO <The voltage between terminal No.6 or 12 and body earth is more than 4.0 V> : Go to Step 5.

NO <The voltage between terminal No.7 or 11 and body earth is more than 4.0 V> : Go to Step 4.

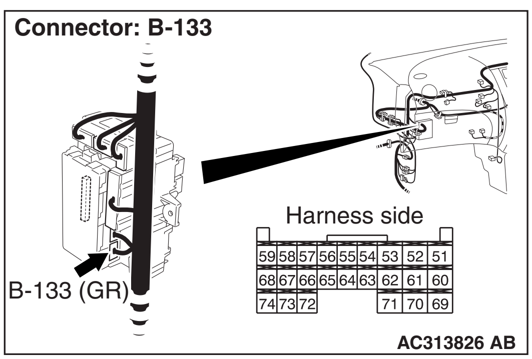
STEP 4. M.U.T.-III CAN bus diagnostics (B-133 ETACS-ECU connector disconnected)

⚠ CAUTION

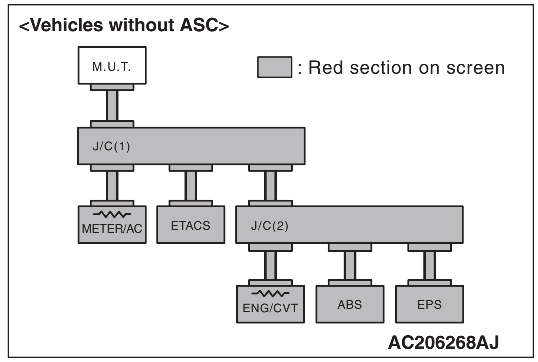
A digital multimeter should be used. For details refer to P.54D-5.

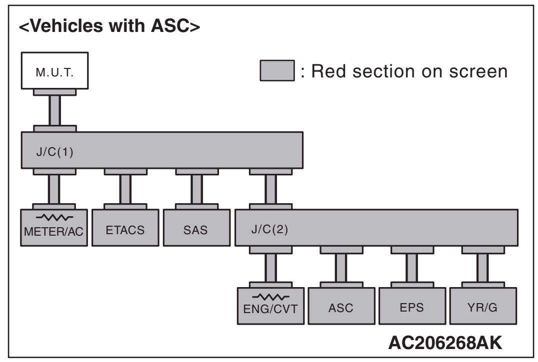
⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.



(1) Disconnect the ETACS-ECU connector, and diagnose by using the M.U.T.-III.





(2) Check that the M.U.T.-III indications correspond to the illustration.

Q: Is the check result normal?

YES : <M.U.T.-III indications correspond to the illustration> Repair the wiring harness between joint connector (CAN1) and ETACS-ECU connector.

NO : <M.U.T.-III indications do not correspond to the illustration> Check the ETACS-ECU connector, and repair if necessary. If the ETACS-ECU connector is in good condition, power supply to the ETACS-ECU may be suspected. Diagnose the SWS system. Refer to GROUP 54B – Troubleshooting P.54B-43.

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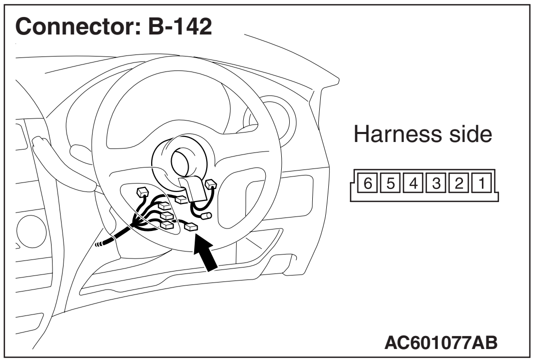
STEP 5. M.U.T.-III CAN bus diagnostics (B-142 steering wheel sensor connector disconnected)

⚠ CAUTION

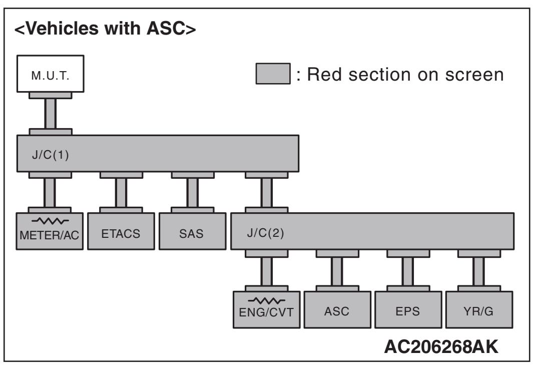
A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.



(1) Disconnect the steering wheel sensor connector, and diagnose by using the M.U.T.-III.



(2) Check that the M.U.T.-III indications correspond to the illustration.

Q: Is the check result normal?

YES : <M.U.T.-III indications correspond to the illustration> Repair the wiring harness between joint connector (CAN1) and steering wheel sensor connector.

NO : <M.U.T.-III indications do not correspond to the illustration> Check the steering wheel sensor connector, and repair if necessary. If the steering wheel sensor connector is in good condition, power supply to the steering wheel sensor may be suspected. Diagnose the ASC system. Refer to GORUP 35C – Troubleshooting P.35C-102.

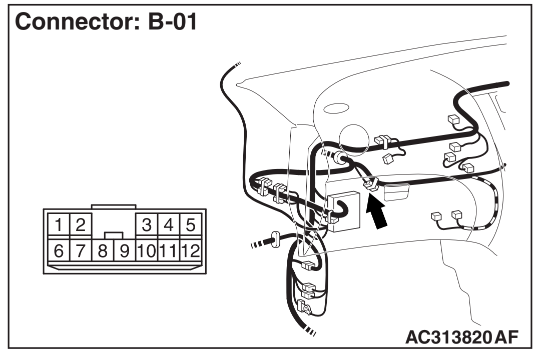
STEP 6. Voltage measurement at B-01 joint connector (CAN2).

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

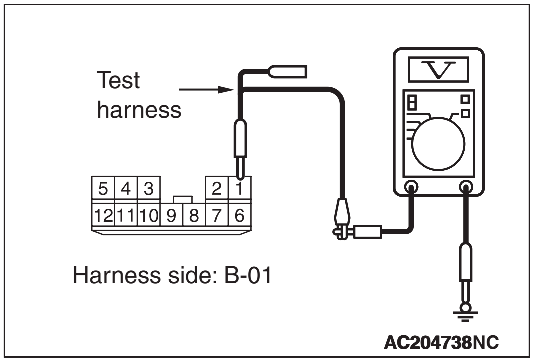
The test wiring harness should be used. For details refer to P.54D-5.



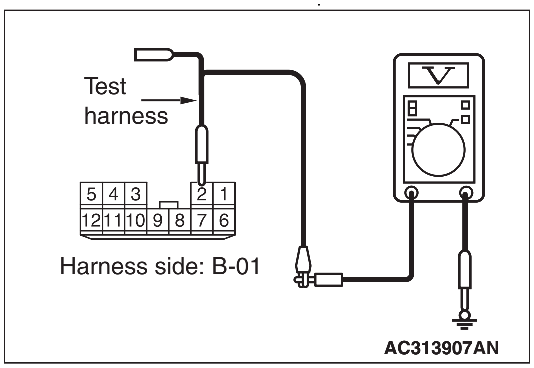
(1) Disconnect joint connector (CAN2), and measure at the wiring harness side.
(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.
(3) Measure the voltage between each of B-01 joint connector (CAN2) terminals and body earth.

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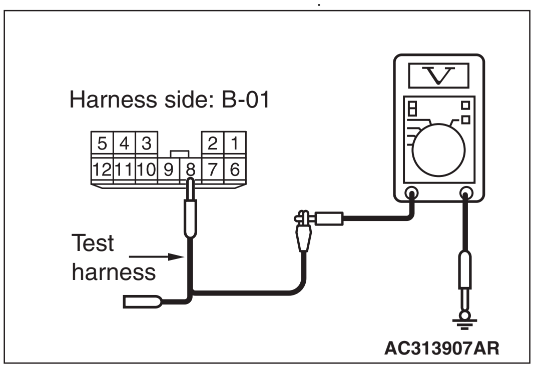
<CAN_H>



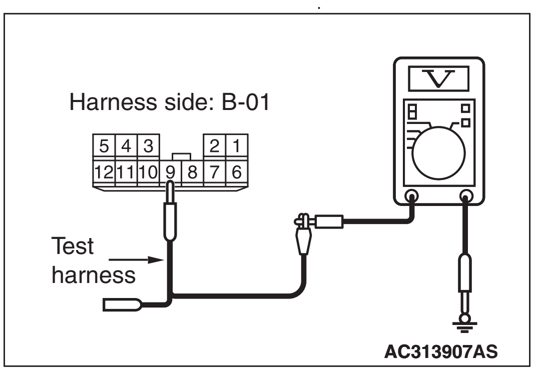
Terminal No.1 and body earth <vehicles with ASC>



Terminal No.2 and body earth



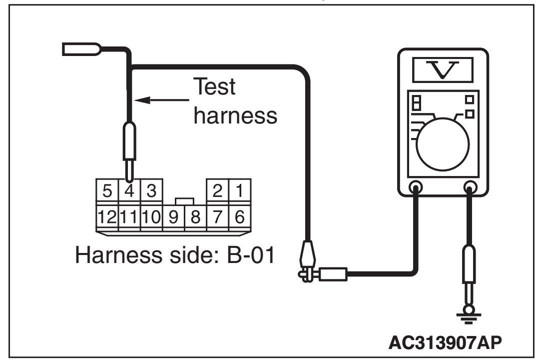
Terminal No.8 and body earth



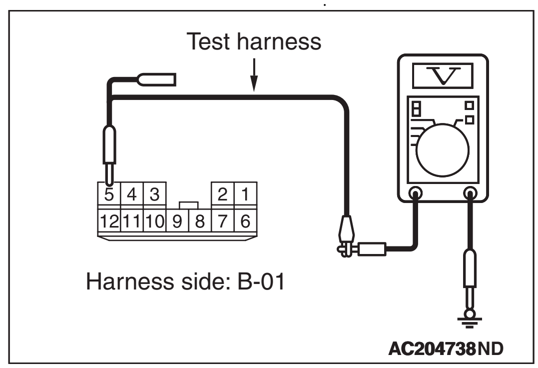
Terminal No.9 and body earth

OK: 4.0 V or less

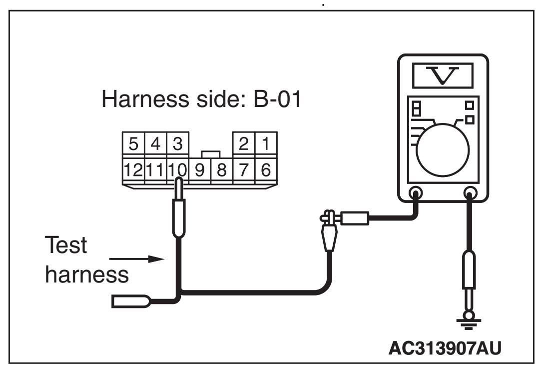
<CAN_L>



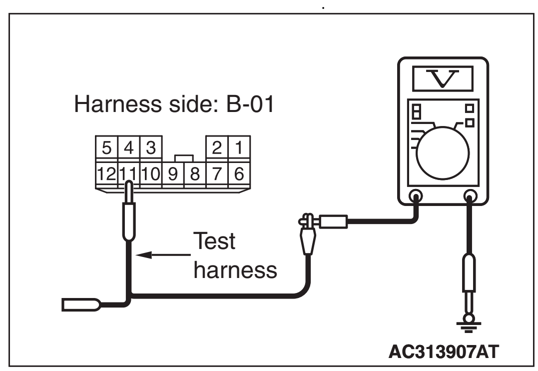
Terminal No.4 and body earth



Terminal No.5 and body earth <vehicles with ASC>



Terminal No.10 and body earth



Terminal No.11 and body earth

OK: 4.0 V or less

(4) Disconnect the negative battery terminal.

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Q: Is the check result normal?

YES <all of the measurement results show 4.0 V or less> : Repair the wiring harness between joint connector (CAN2) and intermediate connector (B-40).

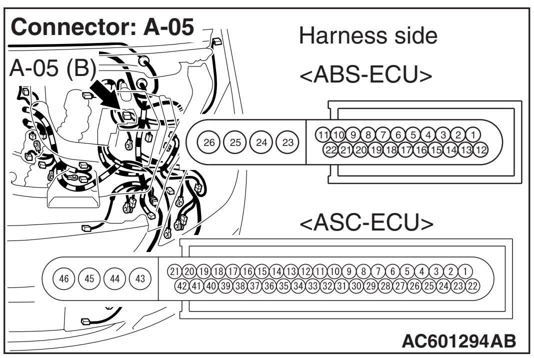
NO <The voltage between terminal No.1 or 5 and body earth is more than 4.0 V> : Go to Step 9.

NO <The voltage between terminal No.2 or 4 and body earth is more than 4.0 V> : Go to Step 7.

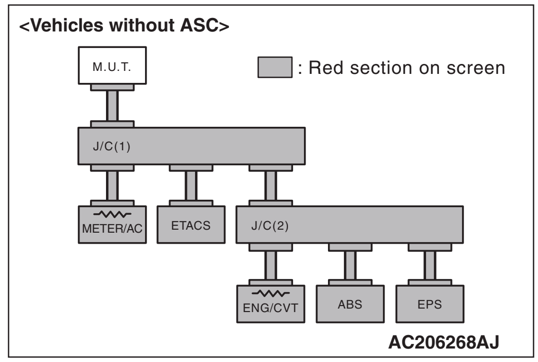
NO <The voltage between terminal No.8 or 11 and body earth is more than 4.0 V> : Go to Step 8.

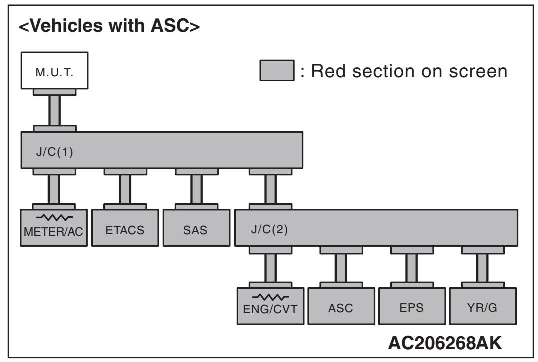
NO <The voltage between terminal No.9 or 10 and body earth is more than 4.0 V> : Repair the wiring harness between joint connector (CAN2) and engine-ECU <M/T> or engine-CVT-ECU <CVT>.

STEP 7. M.U.T.-III CAN bus diagnostics (A-05 ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> connector disconnected)



(1) Disconnect the ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> connector, and diagnose by using the M.U.T.-III.





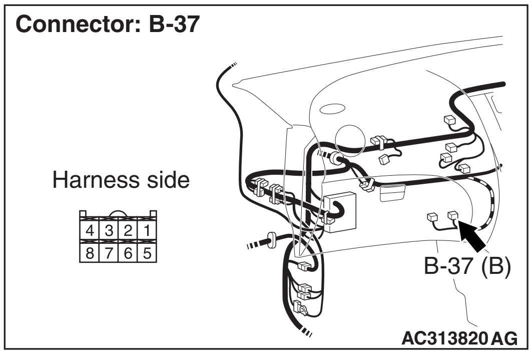
(2) Check that the M.U.T.-III indications correspond to the illustration.

Q: Is the check result normal?

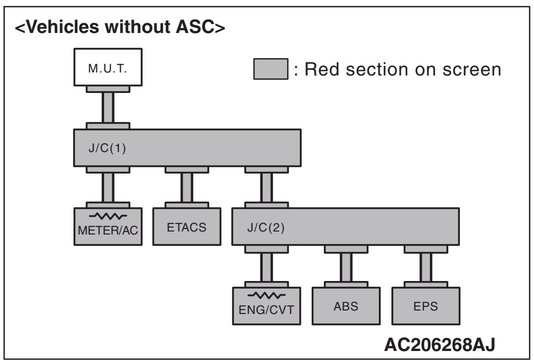
YES : <M.U.T.-III indications correspond to the illustration> Repair the wiring harness between joint connector (CAN2) and ABS-ECU <vehicles without ASC> or ASC-ECU < connector.

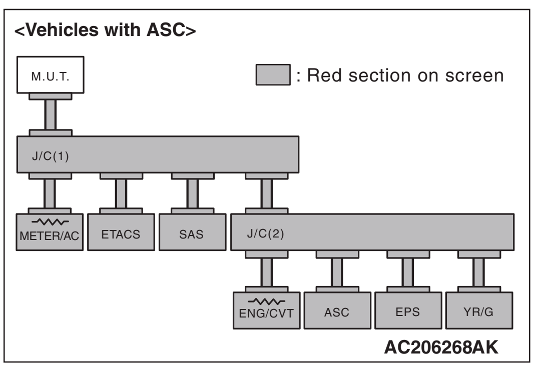
NO : <M.U.T.-III indications do not correspond to the illustration> Check the ABS-ECU <vehicles without ASC> or ASC-ECU < connector, and repair if necessary. If the ABS-ECU <vehicles without ASC> or ASC-ECU < connector is in good condition, power supply to the ABS-ECU <vehicles without ASC> or ASC-ECU < may be suspected. Diagnose the ABS or ASC system. Refer to GROUP 35B – Troubleshooting P.35B-60 <vehicles without ASC> or GROUP 35C – Troubleshooting P.35C-86 <vehicles with ASC>.

STEP 8. M.U.T.-III CAN bus diagnostics (B-37 EPS-ECU connector disconnected)



(1) Disconnect the EPS-ECU connector, and diagnose by using the M.U.T.-III.





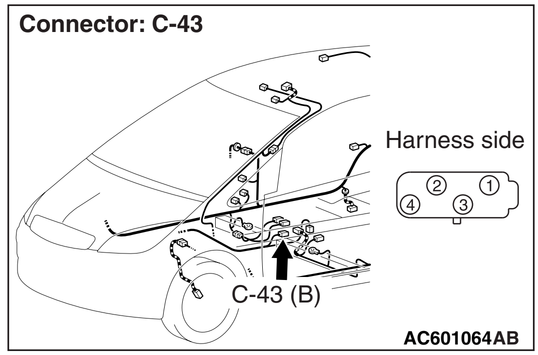
(2) Check that the M.U.T.-III indications correspond to the illustration.

Q: Is the check result normal?

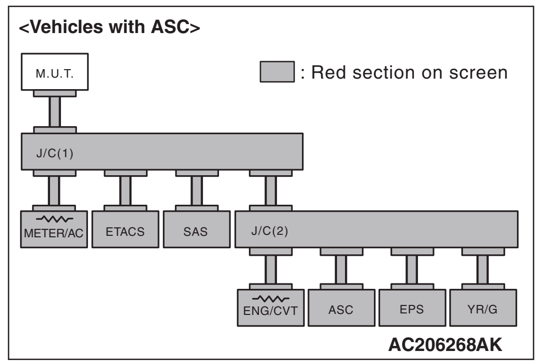
YES : <M.U.T.-III indications correspond to the illustration> Repair the wiring harness between joint connector (CAN2) and EPS-ECU connector.

NO : <M.U.T.-III indications do not correspond to the illustration> Check the EPS-ECU connector, and repair if necessary. If the EPS-ECU connector is in good condition, power supply to the EPS-ECU may be suspected. Diagnose the EPS system. Refer to GROUP 37 – Troubleshooting P.37-74.

STEP 9. M.U.T.-III CAN bus diagnostics (C-43 G and yaw rate sensor connector disconnected)



(1) Disconnect the G and yaw rate sensor connector, and diagnose by using the M.U.T.-III.



(2) Check that the M.U.T.-III indications correspond to the illustration.

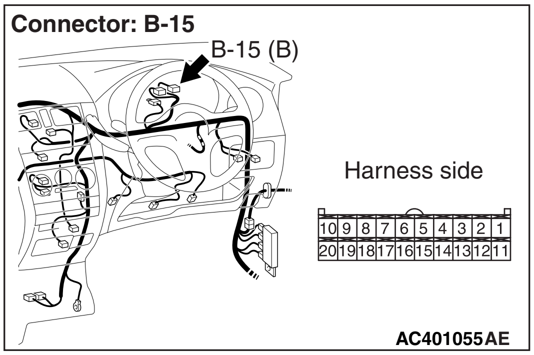
Q: Is the check result normal?

YES : <M.U.T.-III indications correspond to the illustration> Repair the wiring harness between joint connector (CAN2) and G and yaw rate sensor connector.

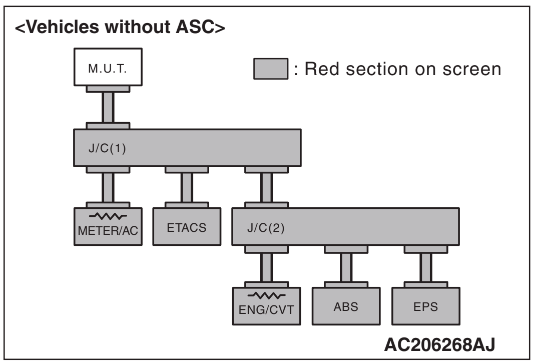
NO : <M.U.T.-III indications do not correspond to the illustration> Check the G and yaw rate sensor connector, and repair if necessary. If the G and yaw rate sensor connector is in good condition, power supply to the G and yaw rate sensor may be suspected. Diagnose the ASC system. Refer to GROUP 35C – Troubleshooting P.35C-105.

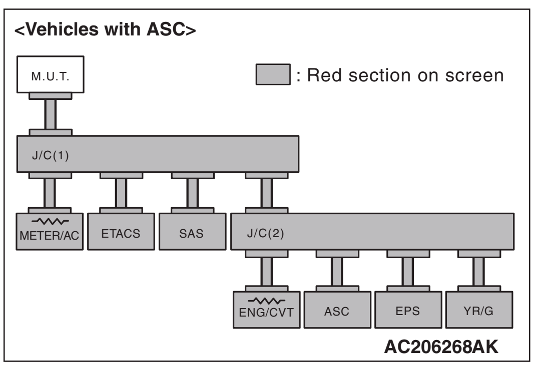
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STEP 10. M.U.T.-III CAN bus diagnostics (B-15 combination meter connector disconnected)



(1) Disconnect the combination meter connector, and diagnose by using the M.U.T.-III.





(2) Check that the M.U.T.-III indications correspond to the illustration.

Q: Is the check result normal?

YES : . <M.U.T.-III indications correspond to the illustration> Go to Step 12.

NO : . <M.U.T.-III indications do not correspond to the illustration> Go to Step 11.

STEP 11. M.U.T.-III CAN bus diagnostics (retest the system)

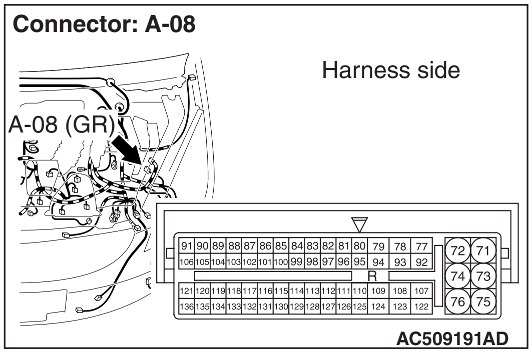
Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

Q: Is the check result normal?

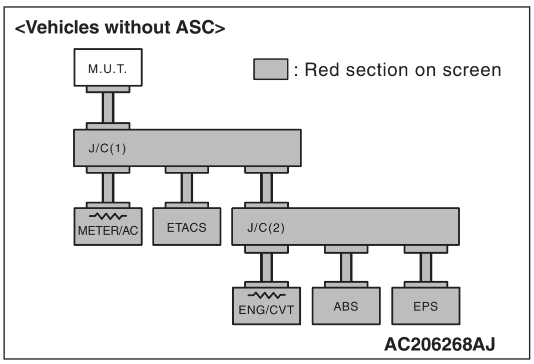
YES : <M.U.T.-III screen shows normal state> The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction P.00-13).

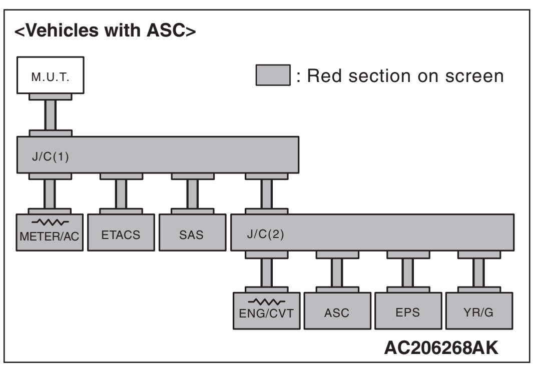
NO : <M.U.T.-III screen does not show normal state> Check the combination meter connector, and repair if necessary. If the combination meter connector is in good condition, refer to GROUP 54A – Combination meter – Troubleshooting P.54A-44.

STEP 12. M.U.T.-III CAN bus diagnostics [A-08 engine-ECU <M/T> or engine-CVT-ECU <CVT> connector disconnected]



(1) Disconnect the engine-ECU <M/T> or engine-CVT-ECU <CVT> connector, and diagnose by using the M.U.T.-III.





(2) Check that the M.U.T.-III indications correspond to the illustration.

Q: Is the check result normal?

YES : . <M.U.T.-III indications correspond to the illustration>The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction P.00-13).

NO : . <M.U.T.-III indications do not correspond to the illustration> Go to Step 13.

STEP 13. M.U.T.-III CAN bus diagnostics (retest the system)

Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

Q: Is the check result normal?

YES : <M.U.T.-III screen shows normal state> The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction P.00-13).

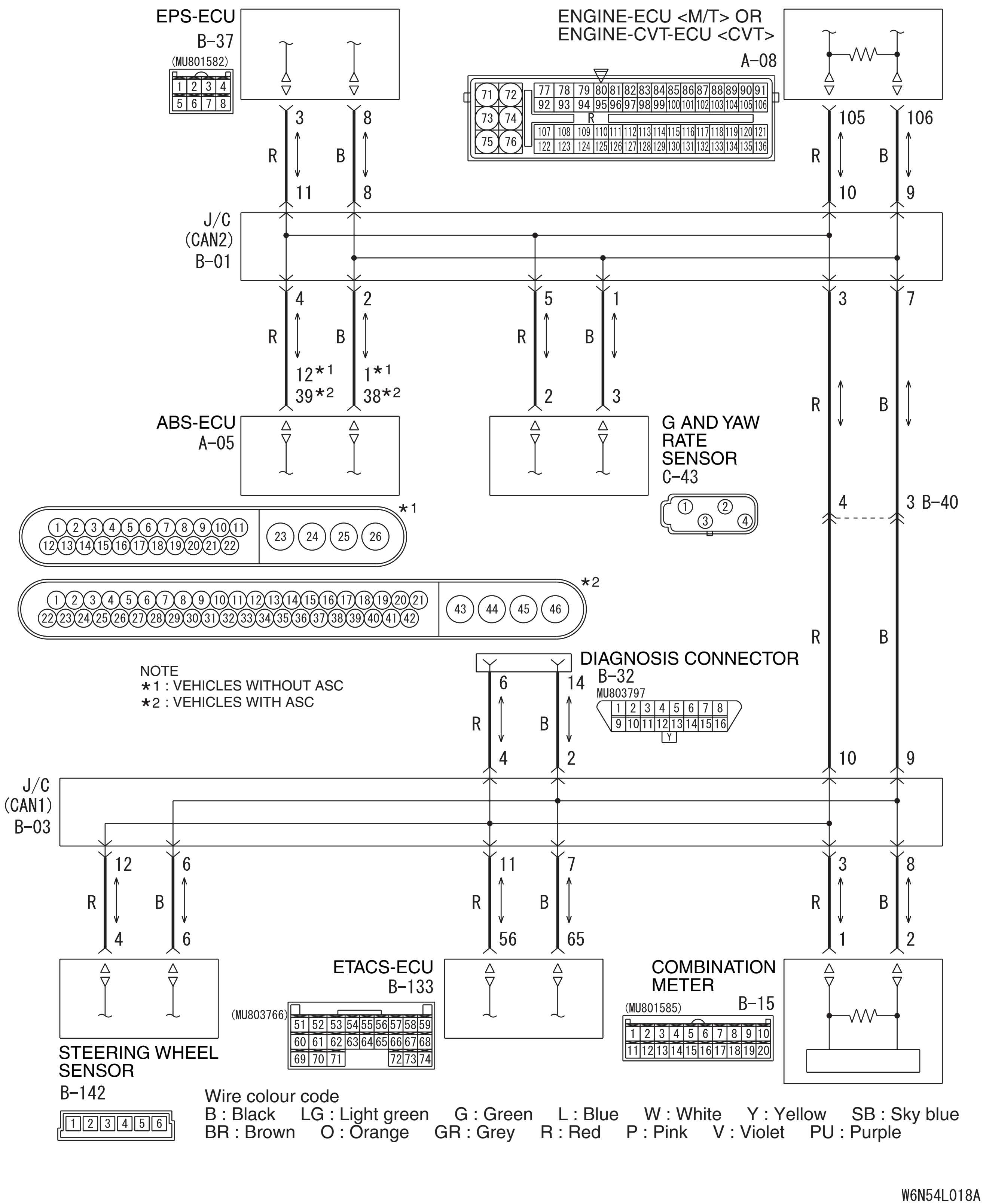
NO : <M.U.T.-III screen does not show normal state> Check the engine-ECU <M/T> or engine-CVT-ECU <CVT>, and repair if necessary. If the engine-ECU <M/T> or engine-CVT-ECU <CVT> is in good condition, refer to GROUP 13A – Troubleshooting P.13A-281 <N/A> or GROUP 13B – Troubleshooting P.13B-282 <T/C>.

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Diagnostic Item 2: Diagnose the CAN bus lines for short to earth.

⚠ CAUTION

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



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FUNCTION

When diagnosing the CAN bus lines, the M.U.T.-III measures the voltage of CAN_H and CAN_L line and detects the short to power supply or earth.

TROUBLE JUDGEMENT CONDITIONS

The M.U.T.-III judges the trouble when it is impossible to receive the periodically sent data and the voltage of CAN_H or CAN_L line is less than 1.0 volt.

POSSIBLE CAUSES

- Malfunction of the wiring harness
- Malfunction of the connector
- Malfunction of each ECU

DIAGNOSIS PROCEDURE

STEP 1.Check the CAN bus lines. Resistance measurement at B-32 diagnosis connector.

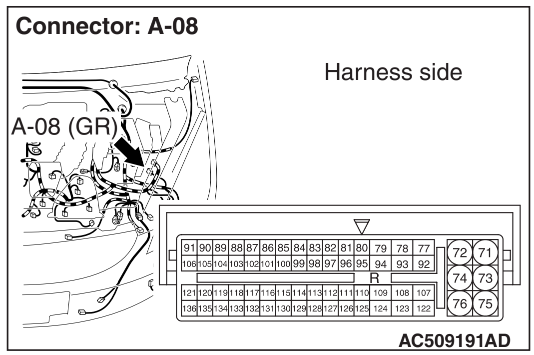
⚠ CAUTION

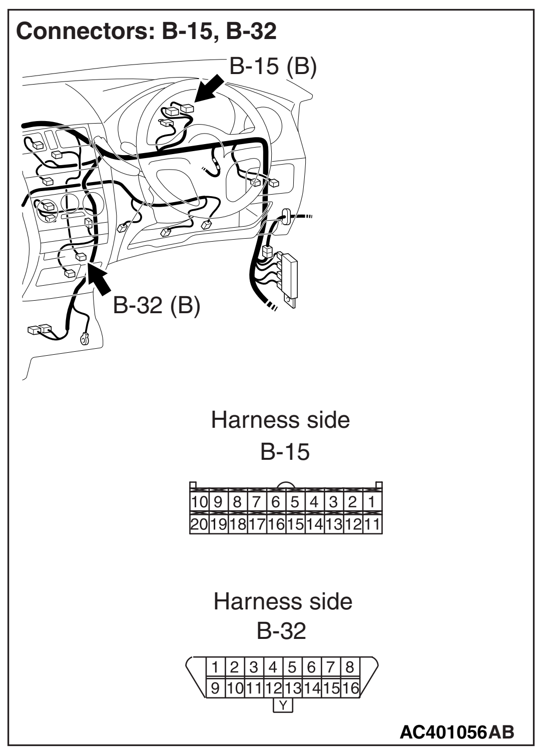
A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.

NOTE: This inspection allows you to check that there is a short to power supply in either CAN_H line or CAN_L line. Thus, in the following steps, check the CAN bus line that is defective.





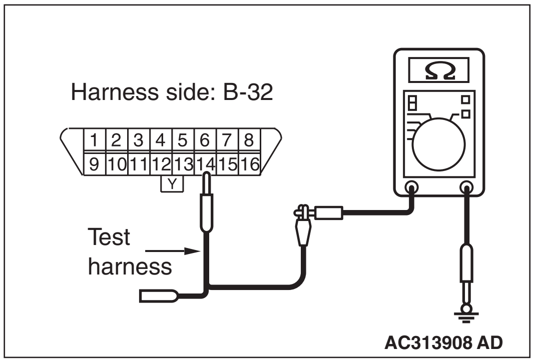
(1) Disconnect engine-ECU <M/T> or engine-CVT-ECU <CVT> connector A-08 and combination meter connector B-15, and measure the voltage at the harness side of diagnosis connector B-32.

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⚠ CAUTION

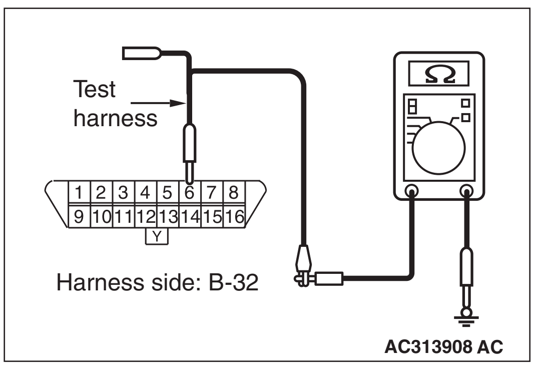
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

(2) Ensure that the negative battery terminal is disconnected.



(3) Resistance between B-32 diagnosis connector terminal No.14 and body earth (CAN_H)

OK: 1 kΩ or more



(4) Resistance between B-32 diagnosis connector terminal No.6 and body earth (CAN_L)

OK: 1 kΩ or more

Q: Is the check result normal?

YES <all of the measurement results show 1 kΩ or more> : Go to Step 10.

NO <Either of CAN_H line or CAN_L line the measurement results show 1 kΩ or more> : Go to Step 2.

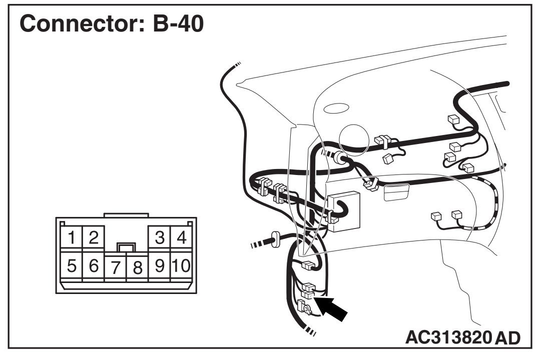
STEP 2. Resistance measurement at B-40 intermediate connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.

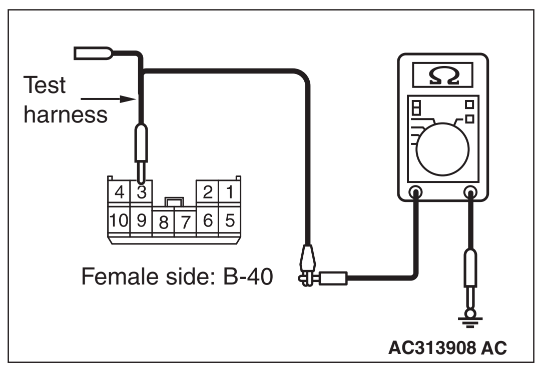


(1) Disconnect intermediate connector (B-40), and measure at its female-side intermediate connector (at the front wiring harness side).

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

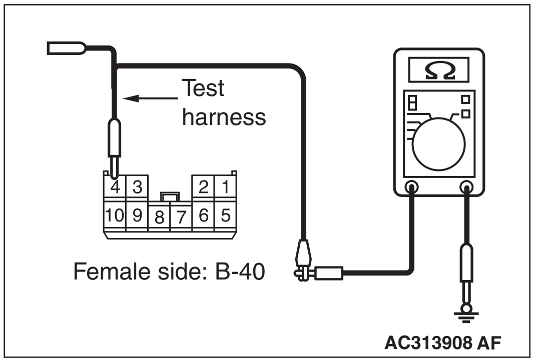
(2) Ensure that the negative battery terminal is disconnected.



(3) Resistance between B-40 intermediate connector terminal No.3 and body earth (CAN_H)

OK: 1 kΩ or more

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(4) Resistance between B-40 intermediate connector terminal No.4 and body earth (CAN_L)

OK: 1 kΩ or more

Q: Is the check result normal?

YES : <1 kΩ or more> Go to Step 7.

NO : <less than 1 kΩ> Go to Step 3.

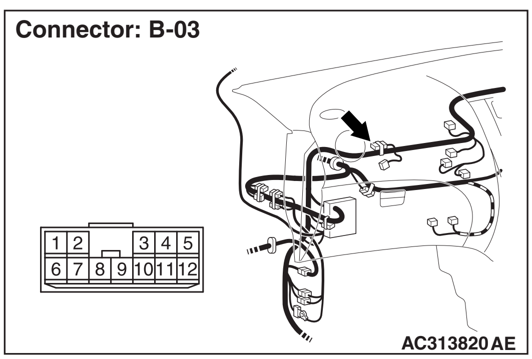
STEP 3. Voltage measurement at B-03 joint connector (CAN1).

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.



(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

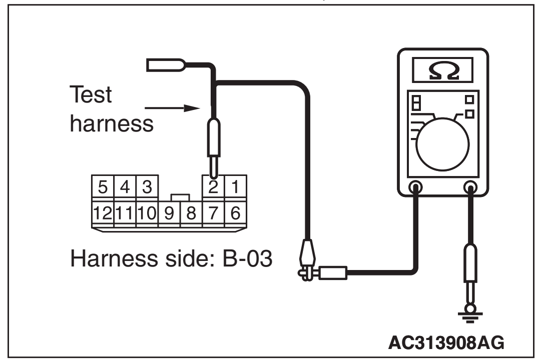
⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

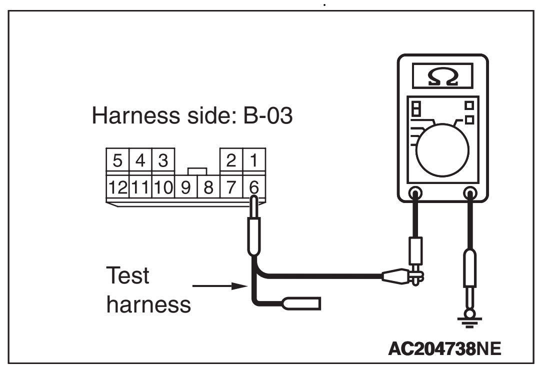
(2) Ensure that the negative battery terminal is disconnected.

(3) Measure the resistance between each of B-03 joint connector (CAN1) terminals and body earth.

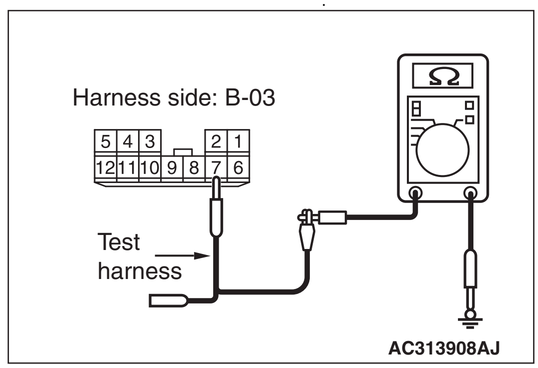
<CAN_H>



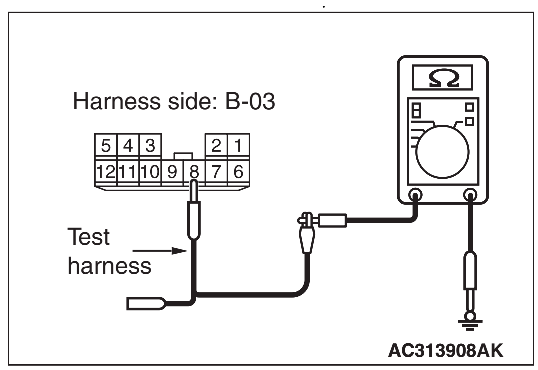
Terminal No.2 and body earth



Terminal No.6 and body earth <vehicles with ASC>



Terminal No.7 and body earth

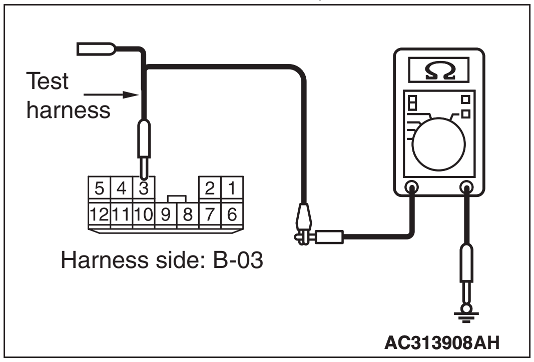


Terminal No.8 and body earth

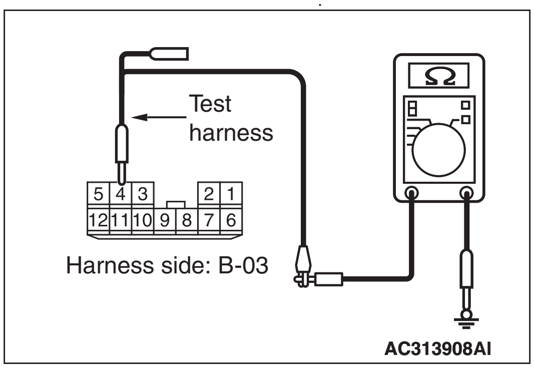
OK: 1 kΩ or more

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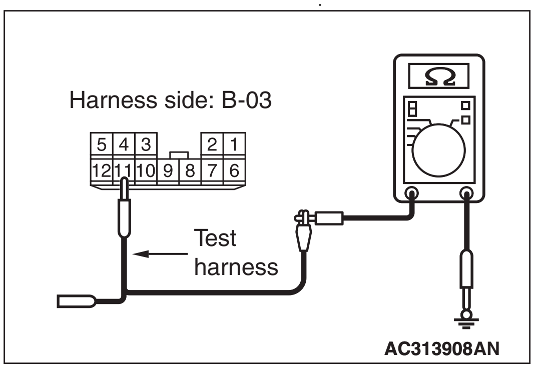
<CAN_L>



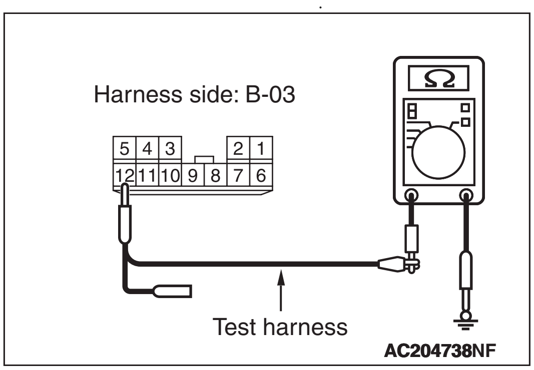
Terminal No.3 and body earth



Terminal No.4 and body earth



Terminal No.11 and body earth



Terminal No.12 and body earth <vehicles with ASC>

OK: 1 kΩ or more

Q: Is the check result normal?

YES <all of the measurement results show 1 kΩ or more> : Repair the wiring harness between joint connector (CAN1) and intermediate connector (B-40).

NO <The resistance between terminal No.2 or 4 and body earth is less than 1 kΩ> : Repair the wiring harness between joint connector (CAN1) and diagnosis connector.

NO <The resistance between terminal No.3 or 8 and body earth is less than 1 kΩ> : Repair the wiring harness between joint connector (CAN1) and combination meter connector.

NO <The resistance between terminal No.6 or 12 and body earth is less than 1 kΩ> : Go to Step 5.

NO <The resistance between terminal No.7 or 11 and body earth is less than 1 kΩ> : Go to Step 4.

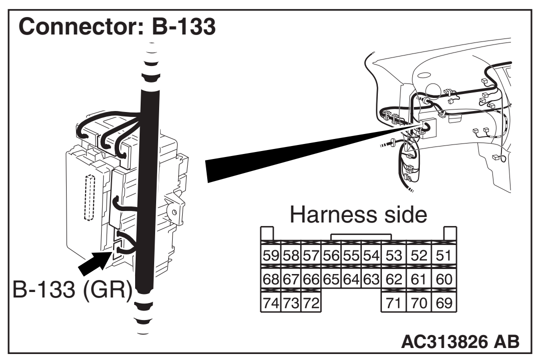
STEP 4. M.U.T.-III CAN bus diagnostics (B-133 ETACS-ECU connector disconnected)

⚠ CAUTION

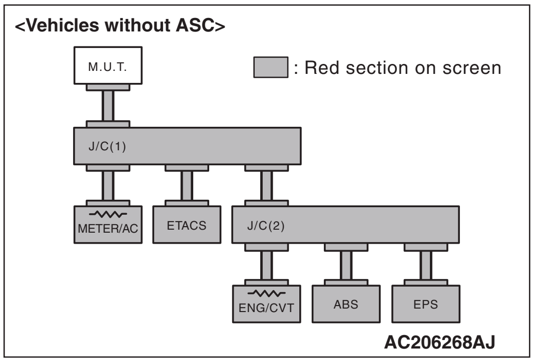
A digital multimeter should be used. For details refer to P.54D-5.

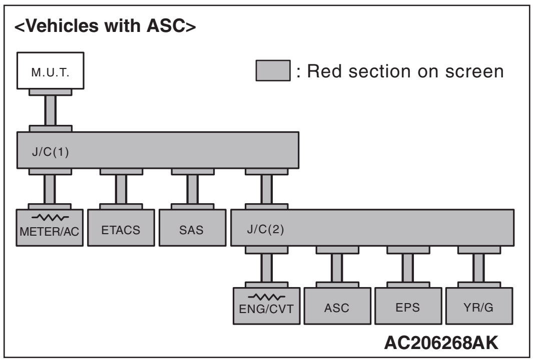
⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.



(1) Disconnect the ETACS-ECU connector, and diagnose by using the M.U.T.-III.





(2) Check that the M.U.T.-III indications correspond to the illustration.

Q: Is the check result normal?

YES : <M.U.T.-III indications correspond to the illustration> Repair the wiring harness between joint connector (CAN1) and ETACS-ECU connector.

NO : <M.U.T.-III indications do not correspond to the illustration> Check the ETACS-ECU connector, and repair if necessary. If the ETACS-ECU connector is in good condition, power supply to the ETACS-ECU may be suspected. Diagnose the SWS system. Refer to GROUP 54B – Troubleshooting P.54B-43.

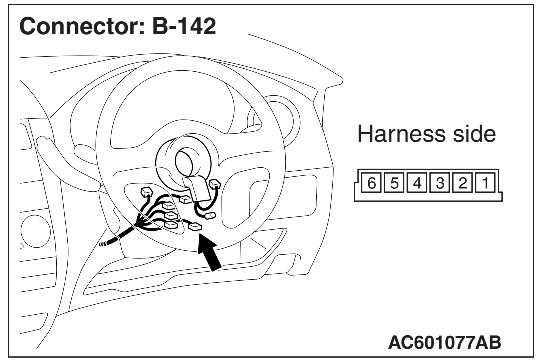
STEP 5. M.U.T.-III CAN bus diagnostics (B-142 steering wheel sensor connector disconnected)

⚠ CAUTION

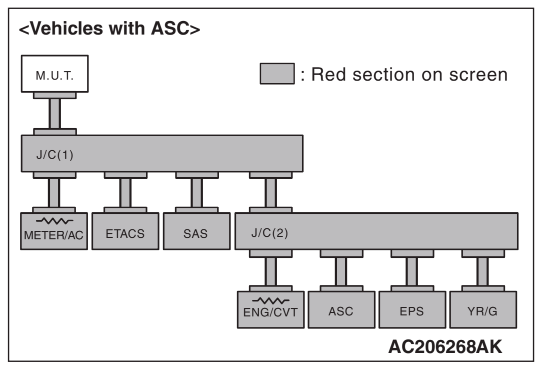
A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.



(1) Disconnect the steering wheel sensor connector, and diagnose by using the M.U.T.-III.



(2) Check that the M.U.T.-III indications correspond to the illustration.

Q: Is the check result normal?

YES : <M.U.T.-III indications correspond to the illustration> Repair the wiring harness between joint connector (CAN1) and steering wheel sensor connector.

NO : <M.U.T.-III indications do not correspond to the illustration> Check the steering wheel sensor connector, and repair if necessary. If the steering wheel sensor connector is in good condition, power supply to the steering wheel sensor may be suspected. Diagnose the ASC system. Refer to GROUP 35C – Troubleshooting P.35C-102.

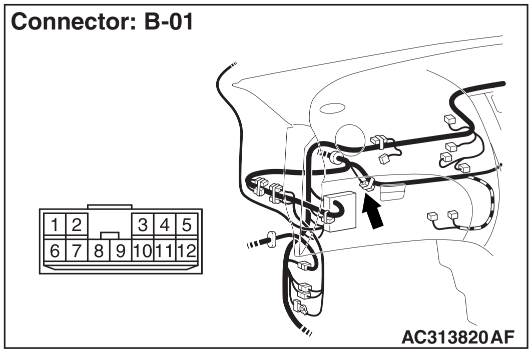
STEP 6. Resistance measurement at the B-01 joint connector (CAN2).

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.



(1) Disconnect the connector, and measure at the wiring harness side.

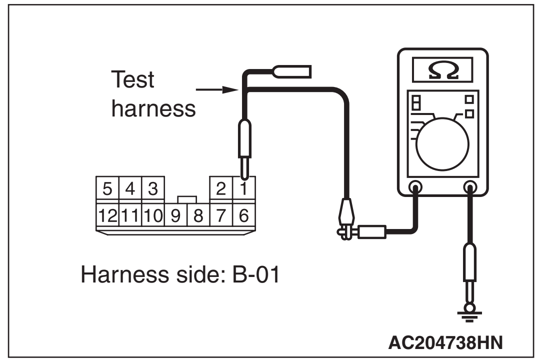
⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

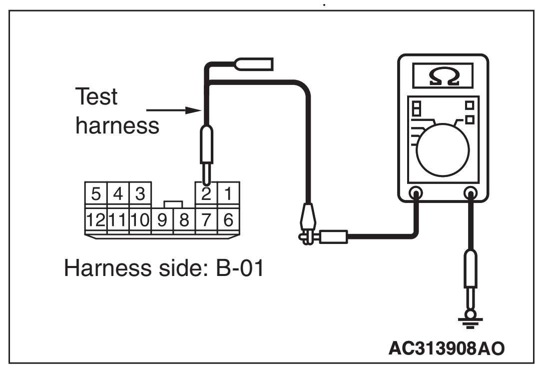
(2) Ensure that the negative battery terminal is disconnected.

(3) Measure the voltage between each of B-01 joint connector (CAN2) terminals and body earth.

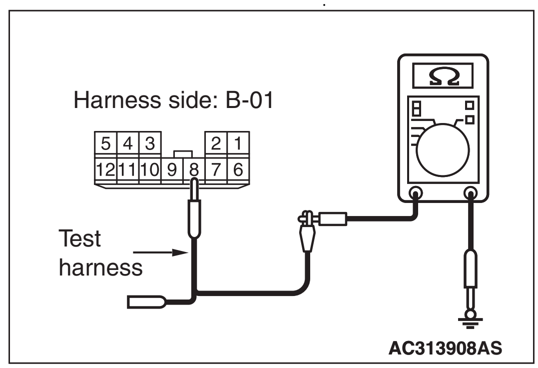
<CAN_H>



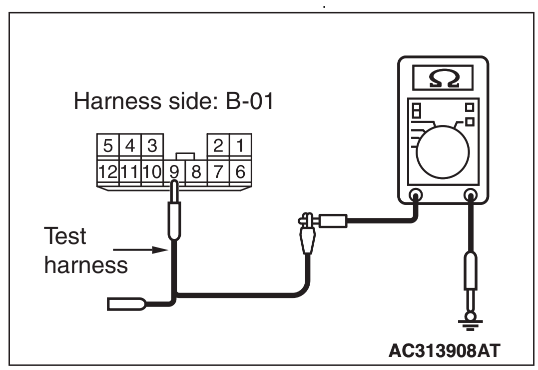
TerminalNo.1 and body earth <vehicles with ASC>



Terminal No.2 and body earth



Terminal No.8 and body earth

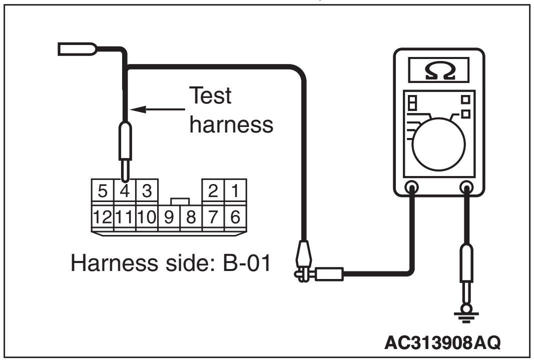


Terminal No.9 and body earth

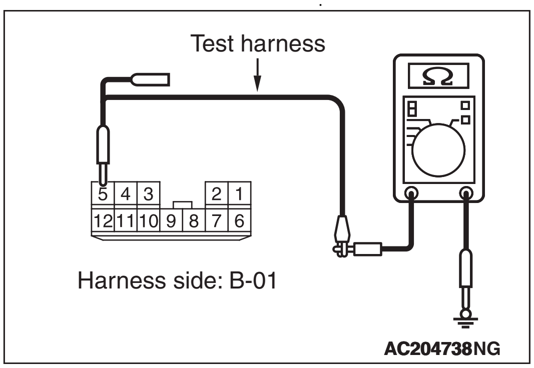
OK: 1 kΩ or more

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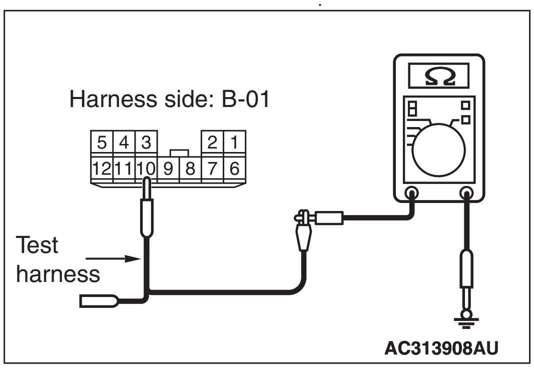
<CAN_L>



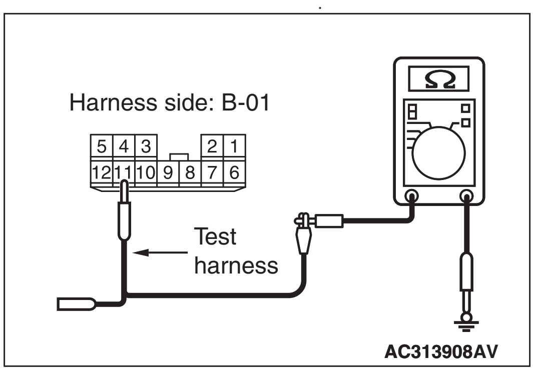
Terminal No.4 and body earth



Terminal No.5 and body earth <vehicles with ASC>



Terminal No.10 and body earth



Terminal No.11 and body earth

OK: 1 kΩ or more

Q: Is the check result normal?

YES <all of the measurement results show 1 kΩ or more> : Repair the wiring harness between joint connector (CAN2) and intermediate connector (B-40).

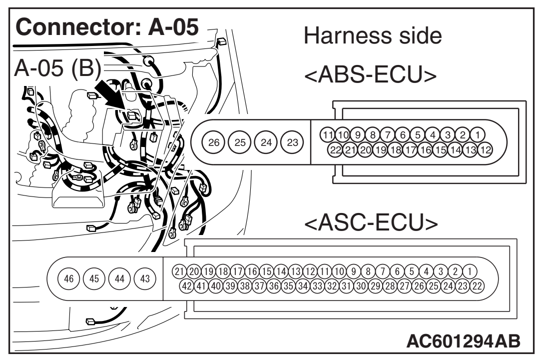
NO <The resistance between terminal No.1 or 5 and body earth is less than 1 kΩ> : Go to Step 9.

NO <The resistance between terminal No.2 or 4 and body earth is less than 1 kΩ> : Go to Step 7.

NO <The resistance between terminal No.8 or 11 and body earth is less than 1 kΩ> : Go to Step 8.

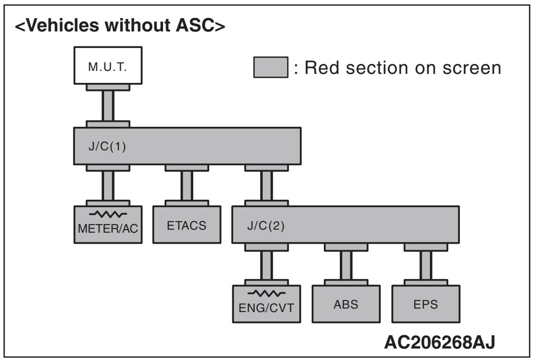
NO <The resistance between terminal No.9 or 10 and body earth is less than 1 kΩ> : Repair the wiring harness between joint connector (CAN2) and engine-ECU <M/T> or engine-CVT-ECU <CVT>.

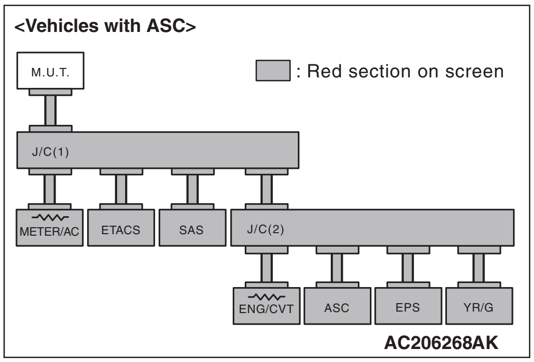
STEP 7. M.U.T.-III CAN bus diagnostics (A-05 ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> connector disconnected)



(1) Disconnect the ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> connector, and diagnose by using the M.U.T.-III.

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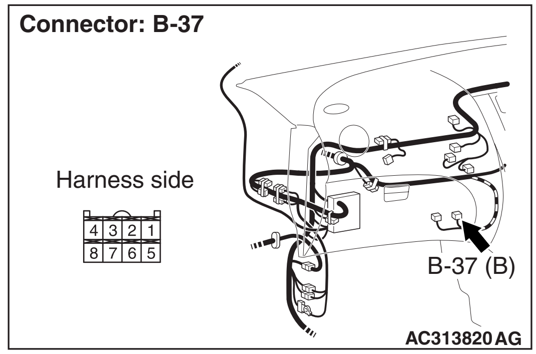
(2) Check that the M.U.T.-III indications correspond to the illustration.

Q: Is the check result normal?

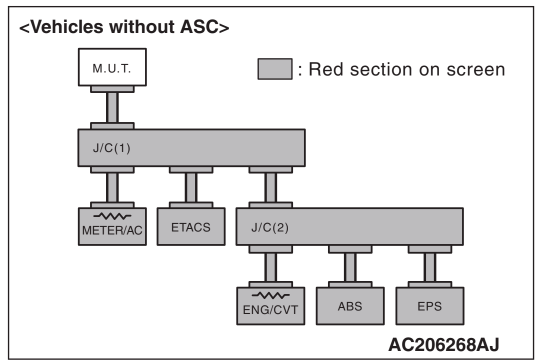
YES : <M.U.T.-III indications correspond to the illustration> Repair the wiring harness between joint connector (CAN2) and ABS-ECU <vehicles without ASC> or ASC-ECU < connector.

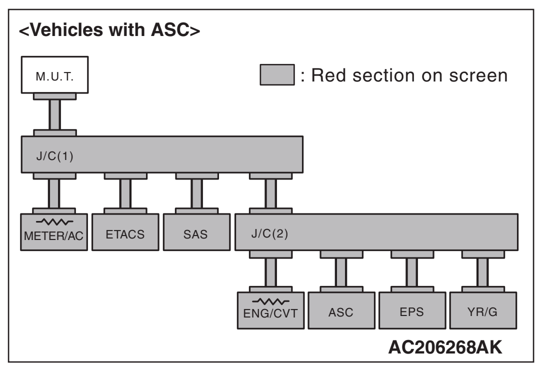
NO : <M.U.T.-III indications do not correspond to the illustration> Check the ABS-ECU <vehicles without ASC> or ASC-ECU < connector, and repair if necessary. If the ABS-ECU <vehicles without ASC> or ASC-ECU < connector is in good condition, power supply to the ABS-ECU <vehicles without ASC> or ASC-ECU < may be suspected. Diagnose the ABS or ASC system. Refer to GROUP 35B – Troubleshooting P.35B-60 <vehicles without ASC> or GROUP 35C – Troubleshooting P.35C-86 <vehicles with ASC>.

STEP 8. M.U.T.-III CAN bus diagnostics (B-37 EPS-ECU connector disconnected)



(1) Disconnect the EPS-ECU connector, and diagnose by using the M.U.T.-III.





(2) Check that the M.U.T.-III indications correspond to the illustration.

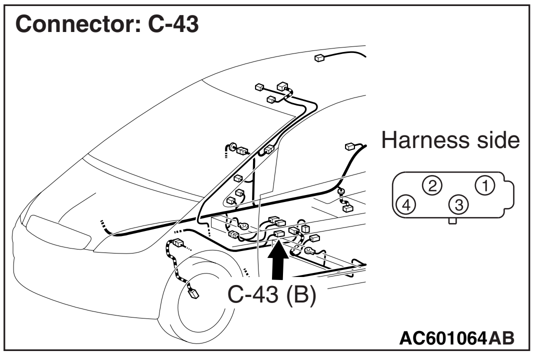
Q: Is the check result normal?

YES : <M.U.T.-III indications correspond to the illustration> Repair the wiring harness between joint connector (CAN2) and EPS-ECU connector.

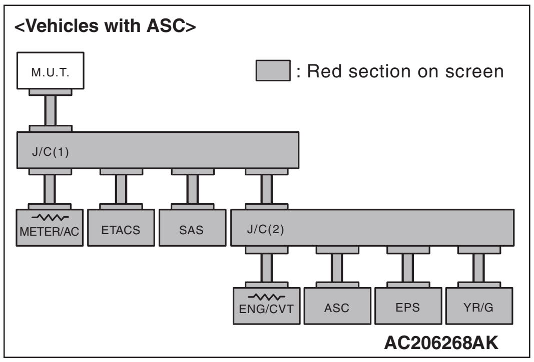
NO : <M.U.T.-III indications do not correspond to the illustration> Check the EPS-ECU connector, and repair if necessary. If the EPS-ECU connector is in good condition, power supply to the EPS-ECU may be suspected. Diagnose the EPS system. Refer to GROUP 37 – Troubleshooting P.37-74.

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STEP 9. M.U.T.-III CAN bus diagnostics (C-43 G and yaw rate sensor connector disconnected)



(1) Disconnect the G and yaw rate sensor connector, and diagnose by using the M.U.T.-III.



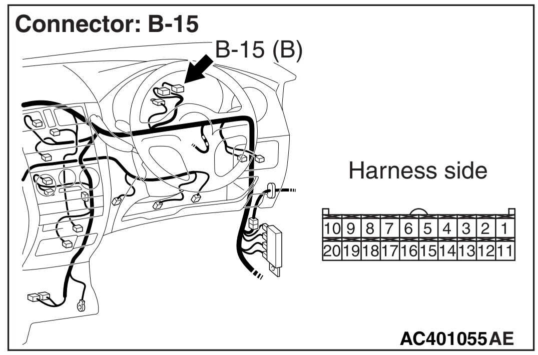
(2) Check that the M.U.T.-III indications correspond to the illustration.

Q: Is the check result normal?

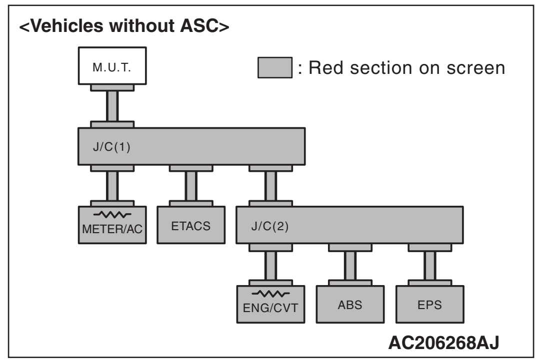
YES : <M.U.T.-III indications correspond to the illustration> Repair the wiring harness between joint connector (CAN2) and G and yaw rate sensor connector.

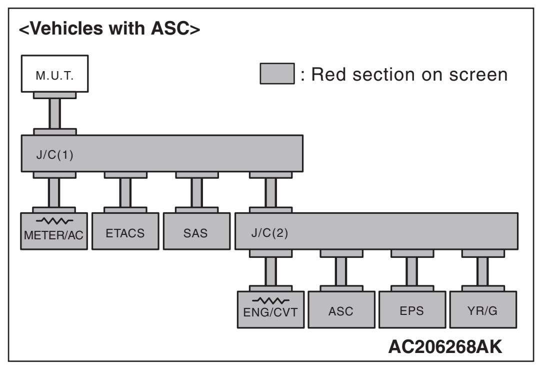
NO : <M.U.T.-III indications do not correspond to the illustration> Check the G and yaw rate sensor connector, and repair if necessary. If the G and yaw rate sensor connector is in good condition, power supply to the G and yaw rate sensor may be suspected. Diagnose the ASC system. Refer to GROUP 35C – Troubleshooting P.35C-105.

STEP 10. M.U.T.-III CAN bus diagnostics (B-15 combination meter connector disconnected)



(1) Disconnect the combination meter connector, and diagnose by using the M.U.T.-III.





(2) Check that the M.U.T.-III indications correspond to the illustration.

Q: Is the check result normal?

YES : <M.U.T.-III indications correspond to the illustration> Go to Step 12.

NO : <M.U.T.-III indications do not correspond to the illustration> Go to Step 11.

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STEP 11. M.U.T.-III CAN bus diagnostics (retest the system)

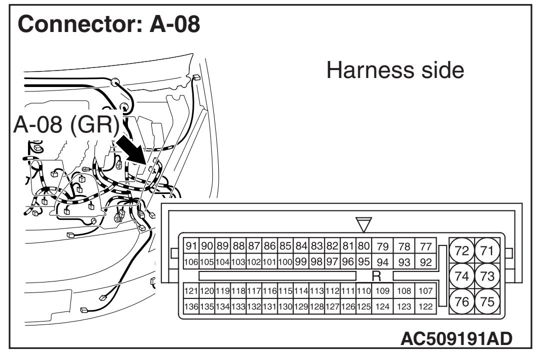
Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

Q: Is the check result normal?

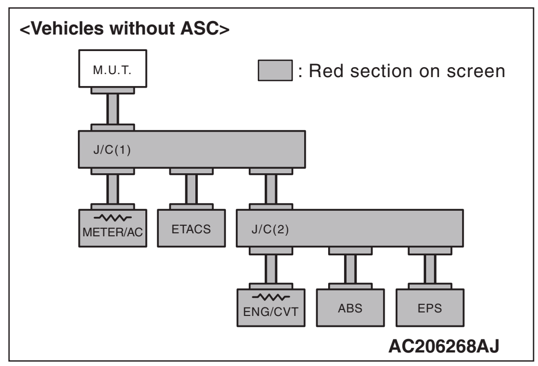
YES : <M.U.T.-III screen shows normal state> The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction P.00-13).

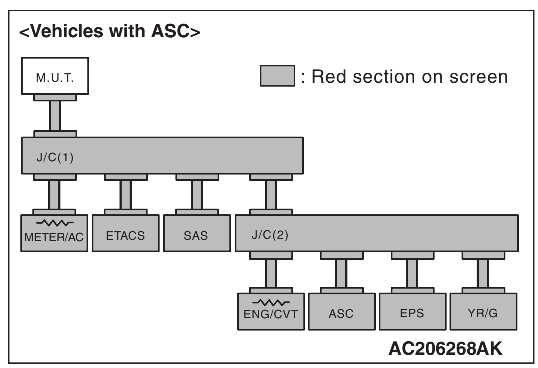
NO : <M.U.T.-III screen does not show normal state> Check the combination meter connector, and repair if necessary. If the combination meter connector is in good condition, refer to GROUP 54A – Combination meter – Troubleshooting P.54A-44.

STEP 12. M.U.T.-III CAN bus diagnostics [A-08 engine-ECU <M/T> or engine-CVT-ECU <CVT> connector disconnected]



(1) Disconnect the engine-ECU <M/T> or engine-CVT-ECU <CVT> connector, and diagnose by using the M.U.T.-III.





(2) Check that the M.U.T.-III indications correspond to the illustration.

Q: Is the check result normal?

YES : <M.U.T.-III indications correspond to the illustration>The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction P.00-13).

NO : <M.U.T.-III indications do not correspond to the illustration> Go to Step 13.

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STEP 13. M.U.T.-III CAN bus diagnostics (retest the system)

Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

Q: Is the check result normal?

YES : <M.U.T.-III screen shows normal state> The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction P.00-13).

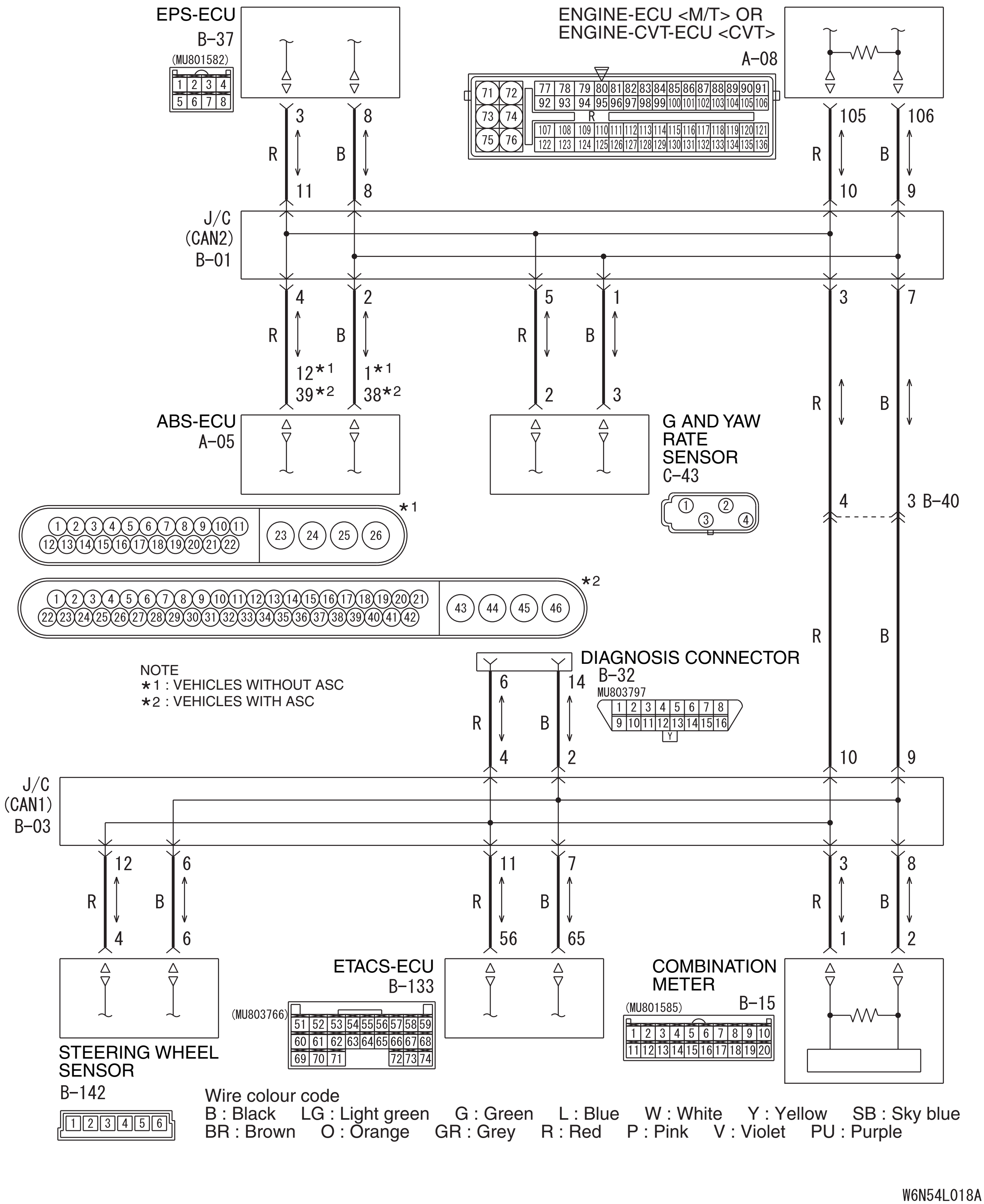
NO : <M.U.T.-III screen does not show normal state> Check the engine-ECU <M/T> or engine-CVT-ECU <CVT>, and repair if necessary. If the engine-ECU <M/T> or engine-CVT-ECU <CVT> is in good condition, refer to GROUP 13A – Troubleshooting P.13A-281 <N/A> or GROUP 13B – Troubleshooting P.13B-282 <T/C>.

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Diagnostic Item 3: Diagnose the lines between CAN_L and CAN_H for short circuit.

⚠ CAUTION

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



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FUNCTION

The M.U.T.-III judges a short between CAN_H and CAN_L line when all data from ECU cannot be received while checking periodically sent data from each ECU even if the voltage is normal.

TROUBLE JUDGEMENT CONDITIONS

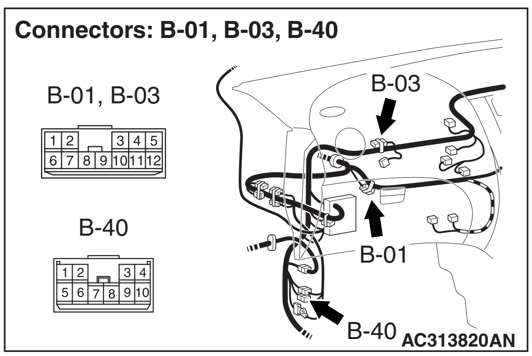
The M.U.T.-III judges the trouble when it is impossible to send and receive the all ECU periodically sent data and the voltage of CAN_H and CAN_L line is 4.0 volts or less and 1.0 volt or more.

POSSIBLE CAUSES

- Malfunction of the wiring harness
- Malfunction of the connector
- Malfunction of each ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-01 joint connector (CAN2), B-03 joint connector (CAN1), B-40 intermediate connector



⚠ CAUTION

The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54D-5.

When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector.

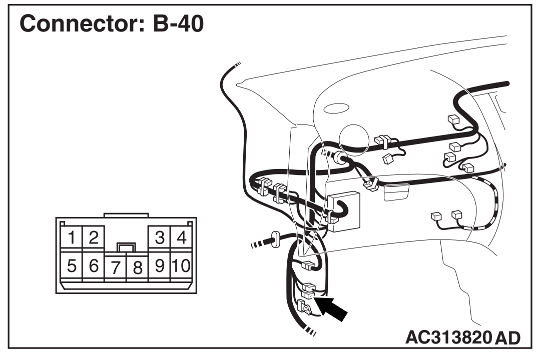
STEP 2. Resistance measurement at the B-40 intermediate connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.



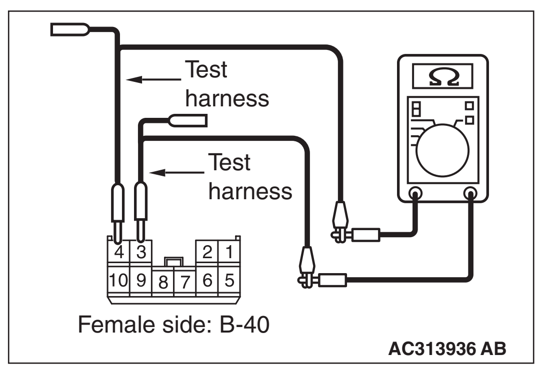
(1) Disconnect the connector, and measure at its female-side intermediate connector (at the front wiring harness side).

(2) Turn the ignition switch to the OFF (LOCK) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

(3) Ensure that the negative battery terminal is disconnected.



(4) Resistance between B-40 intermediate connector terminal Nos.3 and 4

OK: 120 ± 20 Ω

Q: Is the check result normal?

YES : <Within 120 ± 20 Ω> Go to Step 3.

NO : <Not within 120 ± 20 Ω>Go to Step 7.

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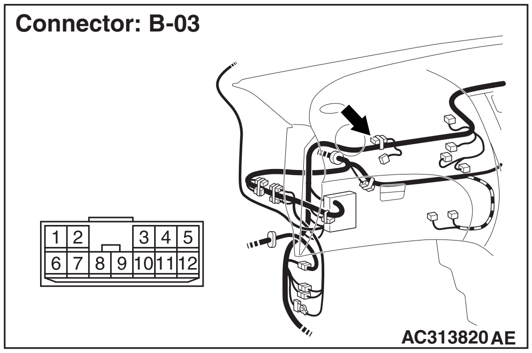
STEP 3. Resistance measurement at the B-03 joint connector (CAN1).

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.

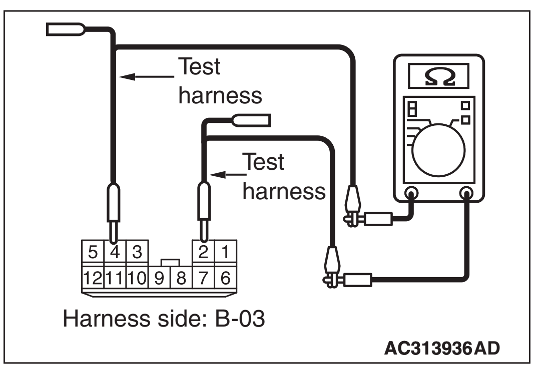


(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the OFF (LOCK) position.

⚠ CAUTION

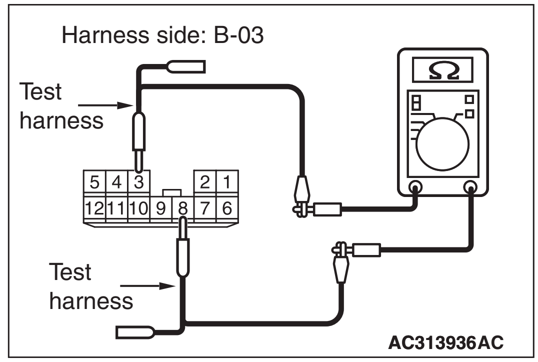
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

(3) Ensure that the negative battery terminal is disconnected.



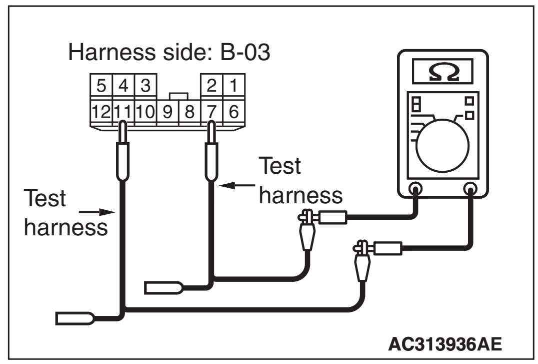
(4) Resistance between B-03 joint connector (CAN1) terminal Nos.2 and 4

OK: 1 kΩ or more



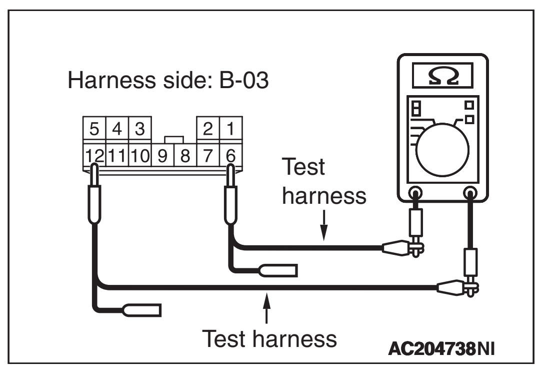
(5) Resistance between B-03 joint connector (CAN1) terminal Nos.3 and 8

OK: 120 ± 20 Ω



(6) Resistance between B-03 joint connector (CAN1) terminal Nos.7 and 11

OK: 1 kΩ or more



(7) Resistance between B-03 joint connector (CAN1) terminal Nos. 6 and 12 <vehicles with ASC>

OK: 1 kΩ or more

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Q: Is the check result normal?

YES <all of the measurement results are within the normal value> : Repair the wiring harness between joint connector (CAN1) and intermediate connector (B-40).

NO <The resistance between terminal Nos.2 and 4 is less than 1 kΩ> : Check the diagnosis connector, and repair if necessary. If the diagnosis connector is in good condition, repair the wiring harness between joint connector (CAN1) and diagnosis connector.

NO <The resistance between terminal Nos.3 and 8 is less than 120 ± 20 Ω> : Go to Step 4.

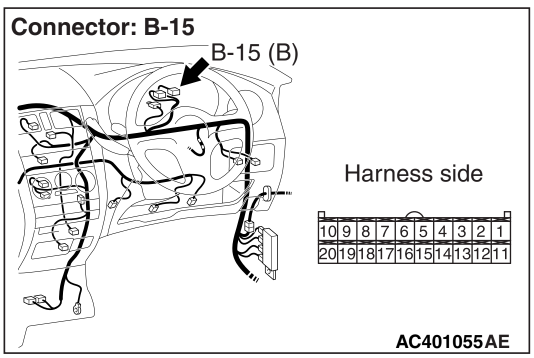
NO <The resistance between terminal Nos.6 and 12 is less than 120 ± 20 Ω> : Go to Step 6.

NO <The resistance between terminal Nos.7 and 11 is less than 120 ± 20 Ω> : Go to Step 5.

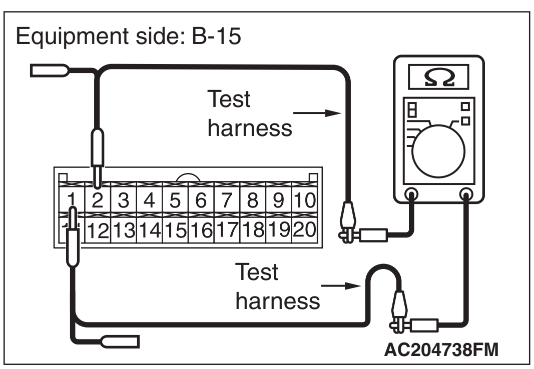
STEP 4. Resistance measurement at B-15 combination meter connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.



(1) Remove the combination meter, and measure at the equipment side.



(2) Resistance between B-15 combination meter connector terminal Nos.1 and 2

OK: 120 ± 20 Ω

Q: Is the check result normal?

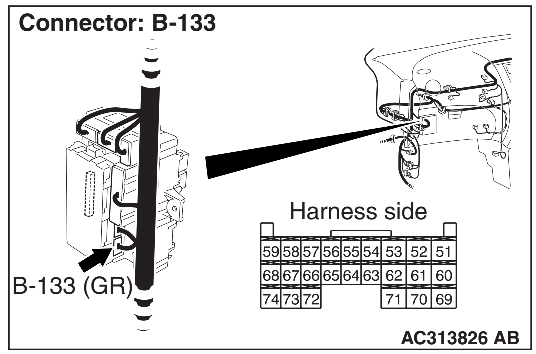
YES : <Within 120 ± 20 Ω> Repair the wiring harness between joint connector (CAN1) and combination meter connector.

NO : <Not within 120 ± 20 Ω> Check the combination meter connector, and repair if necessary. If the combination meter connector is in good condition, replace the combination meter.

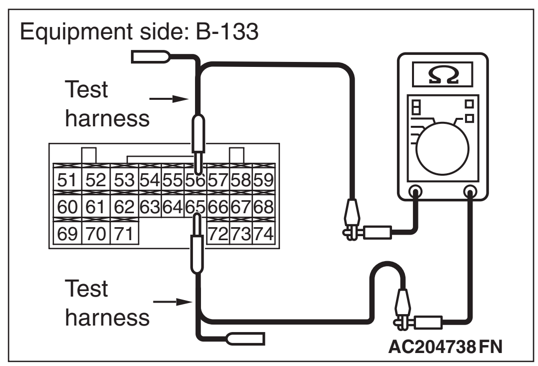
STEP 5. Resistance measurement at B-133 ETACS-ECU connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.



(1) Remove the ETACS-ECU, and measure at the equipment side.



(2) Resistance between B-133 ETACS-ECU connector terminal Nos.56 and 65

OK: 1 kΩ or more

Q: Is the check result normal?

YES : <1 kΩ or more> Repair the wiring harness between joint connector (CAN1) and ETACS-ECU connector.

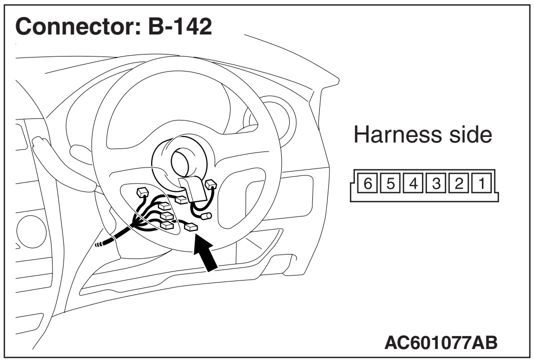
NO : <Less than 1 kΩ> Check the ETACS-ECU connector, and repair if necessary. If the ETACS-ECU connector is in good condition, replace the ETACS-ECU.

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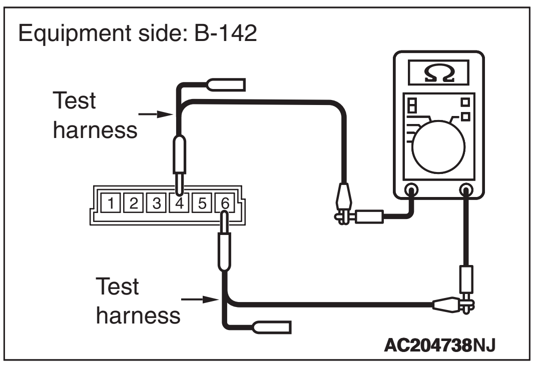
STEP 6. Resistance measurement at B-142 steering wheel sensor connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.



(1) Remove the steering wheel sensor, and measure at the equipment side.



(2) Resistance between B-142 steering wheel sensor connector terminal Nos.4 and 6

OK: 1 kΩ or more

Q: Is the check result normal?

YES : <1 kΩ or more> Repair the wiring harness between joint connector (CAN1) and steering wheel sensor connector.

NO : <Less than 1 kΩ> Check the steering wheel sensor connector, and repair if necessary. If the steering wheel sensor connector is in good condition, replace the steering wheel sensor.

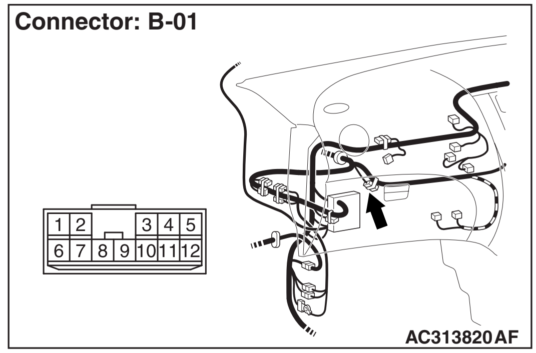
STEP 7. Resistance measurement at the B-01 joint connector (CAN2).

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.



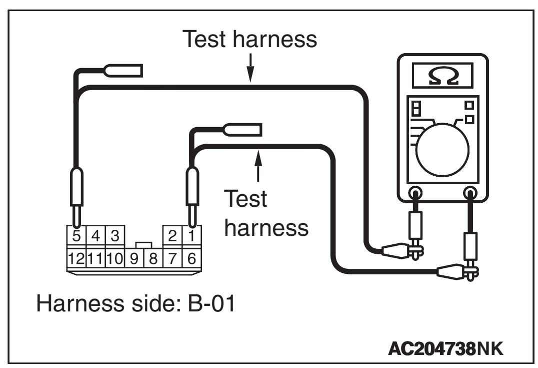
(1) Disconnect the connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the OFF (LOCK) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

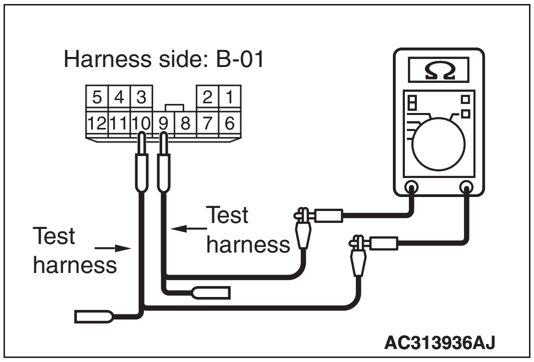
(3) Ensure that the negative battery terminal is disconnected.



(4) Resistance between B-01 joint connector (CAN2) terminal Nos.1 and 5 <vehicles with ASC>

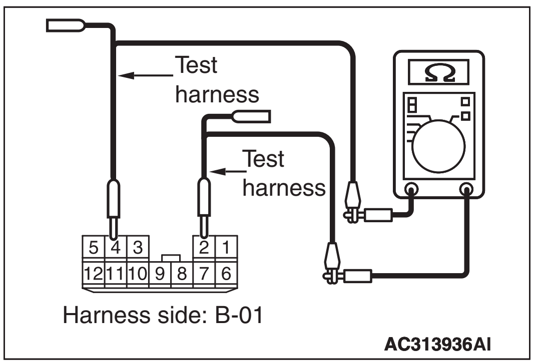
OK: 1 kΩ or more

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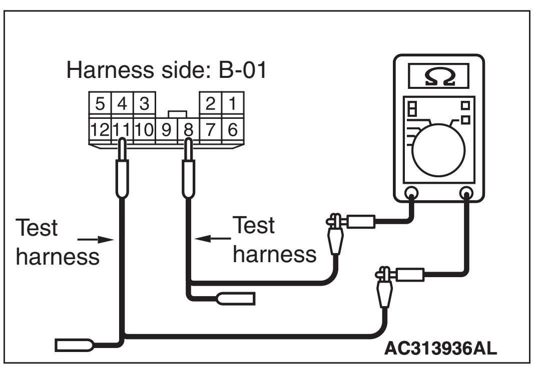
(5) Resistance between B-01 joint connector (CAN2) terminal Nos.9 and 10

OK: 120 ± 20 Ω



(6) Resistance between B-01 joint connector (CAN2) terminal Nos.2 and 4

OK: 1 kΩ or more



(7) Resistance between B-01 joint connector (CAN2) terminal Nos.8 and 11

OK: 1 kΩ or more

Q: Is the check result normal?

YES <all of the measurement results are within the normal value> : Repair the wiring harness between joint connector (CAN2) and intermediate connector (B-40).

NO <The resistance between terminal Nos.1 and 5 is less than 1 kΩ> : Go to Step 11.

NO <The resistance between terminal Nos.2 and 4 is less than 1 kΩ> : Go to Step 9.

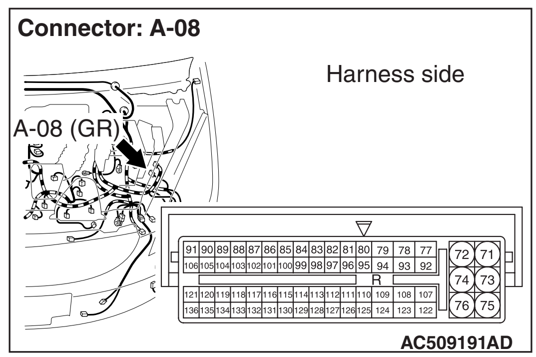
NO <The resistance between terminal Nos.8 and 11 is less than 1 kΩ> : Go to Step 10.

NO <The resistance between terminal Nos.9 and 10 is less than 120 ± 20 Ω> : Go to Step 8.

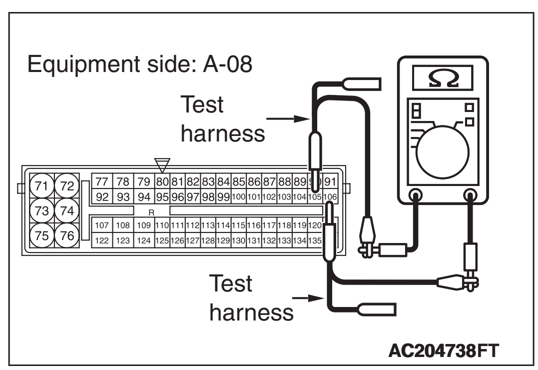
STEP 8. Resistance measurement at A-08 engine-ECU <M/T> or engine-CVT-ECU <CVT> connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.



(1) Remove the engine-ECU <M/T> or engine-CVT-ECU <CVT>, and measure at the equipment side.



(2) Resistance at A-08 engine-ECU <M/T> or engine-CVT-ECU <CVT> connector terminal Nos.105 and 106

OK: 120 ± 20 Ω

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Q: Is the check result normal?

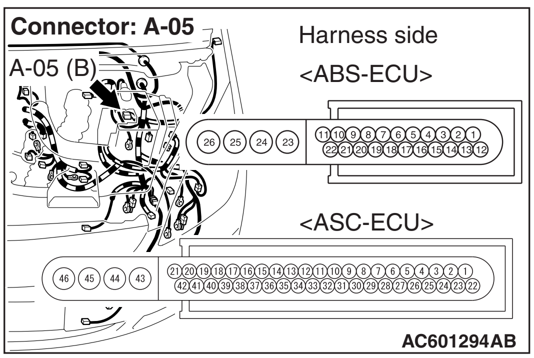
YES : <Within 120 ± 20 Ω> Repair the wiring harness between joint connector (CAN2) and engine-ECU <M/T> or engine-CVT-ECU <CVT> connector.

NO : <Not within 120 ± 20 Ω> Check the engine-ECU <M/T> or engine-CVT-ECU <CVT> connector, and repair if necessary. If the engine-ECU <M/T> or engine-CVT-ECU <CVT> connector is in good condition, replace the engine-ECU <M/T> or engine-CVT-ECU <CVT>.

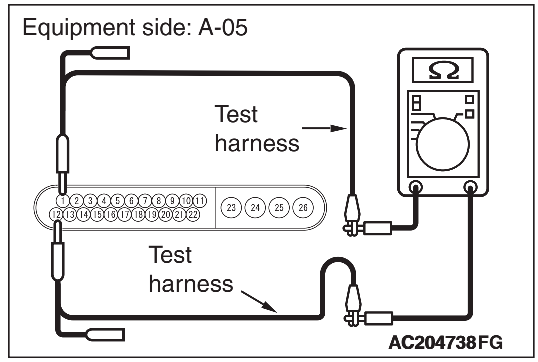
STEP 9. Resistance measurement at A-05 ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

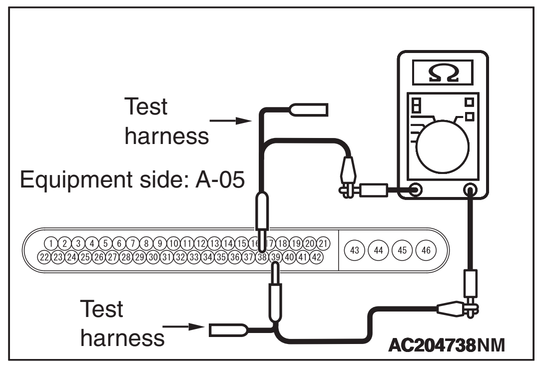


(1) Remove the ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC>, and measure at the equipment side.



(2) Resistance at A-05 ASC-ECU connector terminal Nos.1 and 12 <vehicles without ASC>

OK: 1 kΩ or more



(3) Resistance at A-05 ASC-ECU connector terminal Nos.38 and 39 <vehicles with ASC>

OK: 1 kΩ or more

Q: Is the check result normal?

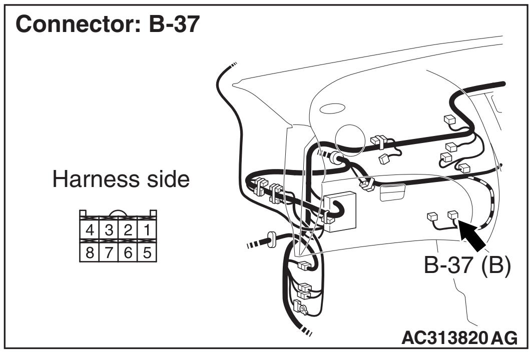
YES : <1 kΩ or more> Repair the wiring harness between joint connector (CAN2) and ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> connector.

NO : <Less than 1 kΩ> Check the ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> connector, and repair if necessary. If the ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> connector is in good condition, replace the ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC>.

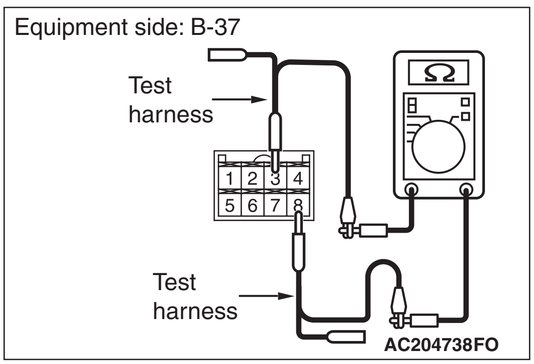
STEP 10. Resistance measurement at B-37 EPS-ECU connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.



(1) Remove the EPS-ECU, and measure at the equipment side.



(2) Resistance at B-37 EPS-ECU connector terminal Nos.3 and 8

OK: 1 kΩ or more

Q: Is the check result normal?

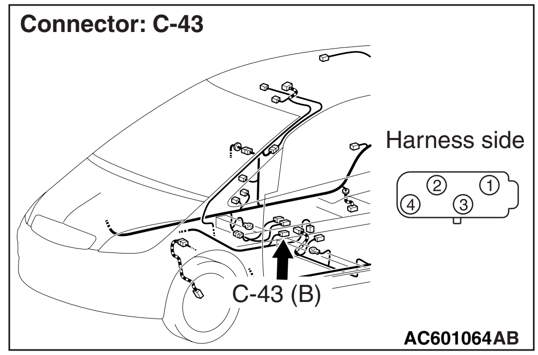
YES : <1 kΩ or more> Repair the wiring harness between joint connector (CAN2) and EPS-ECU connector.

NO : <Less than 1 kΩ> Check the EPS-ECU connector, and repair if necessary. If the EPS-ECU connector is in good condition, replace the EPS-ECU.

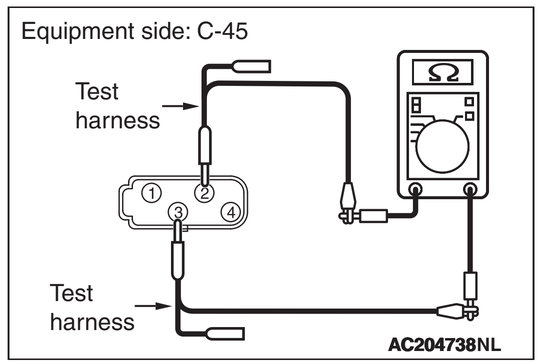
STEP 11. Resistance measurement at C-43 G and yaw rate sensor connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.



(1) Remove the G and yaw rate sensor, and measure at the equipment side.



(2) Resistance at C-43 G and yaw rate sensor connector terminal Nos.2 and 3

OK: 1 kΩ or more

Q: Is the check result normal?

YES : <1 kΩ or more> Repair the wiring harness between joint connector (CAN2) and G and yaw rate sensor connector.

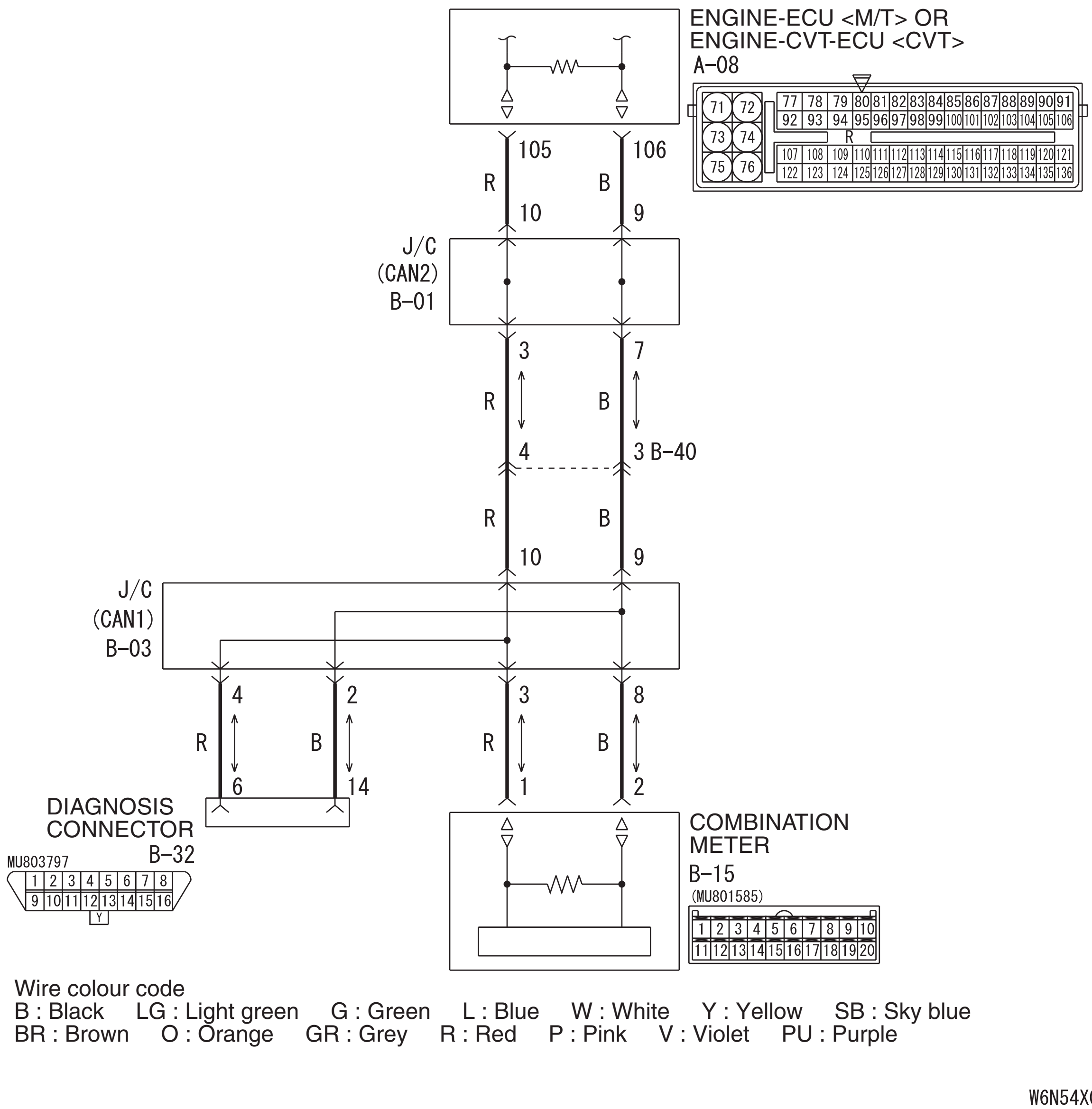
NO : <Less than 1 kΩ> Check the G and yaw rate sensor connector, and repair if necessary. If the G and yaw rate sensor connector is in good condition, replace the G and yaw rate sensor.

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Diagnostic Item 4: Diagnose the terminator resistors at both ends.

⚠ CAUTION

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The resistance in the communication errors condition cannot be measured by the CAN bus diagnostics, therefore, judge the terminator resistor only when receiving the each ECU periodically sent data normally.

TROUBLE JUDGEMENT CONDITIONS

The M.U.T.-III judges the trouble when the periodically sent data from each ECU can be received normally but the resistance value between CAN_H and CAN_L line is other than from 50 ohms to 70 ohms.

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POSSIBLE CAUSES

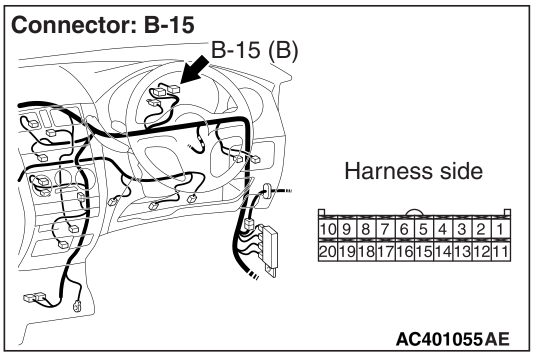
- Damaged harness wires and connectors
- Malfunction of the combination meter (incorporating meter-A/C-ECU)
- Malfunction of the engine-ECU <M/T> or engine-CVT-ECU <CVT>

DIAGNOSIS PROCEDURE

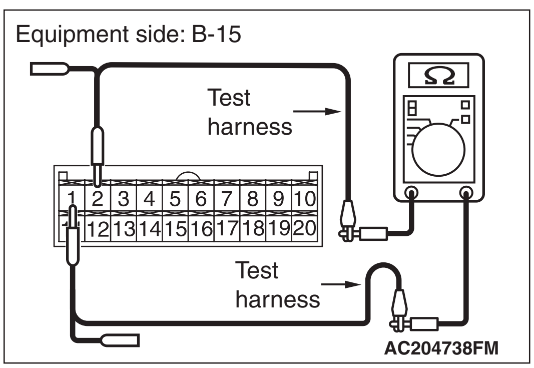
STEP 1. Resistance measurement at B-15 combination meter connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.



(1) Remove the combination meter, and measure at the equipment side.



(2) Resistance between B-15 combination meter connector terminal Nos.1 and 2

OK: 120 ± 20 Ω

Q: Is the check result normal?

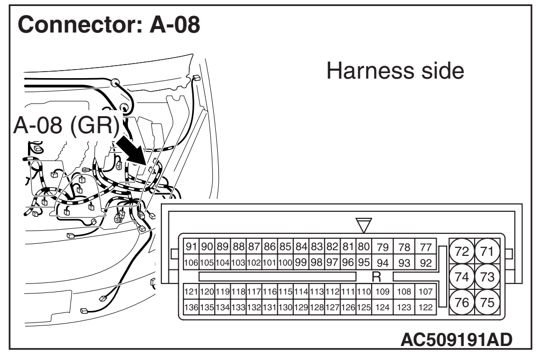
YES : <Within 120 ± 20 Ω> Go to Step 2.

NO : <Not within 120 ± 20 Ω> Replace the combination meter.

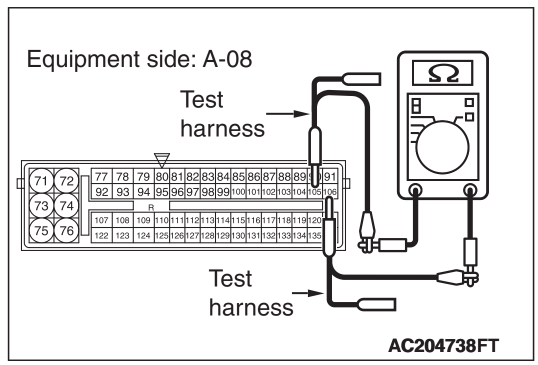
STEP 2. Resistance measurement at A-08 engine-ECU <M/T> or engine-CVT-ECU <CVT> connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.



(1) Remove the engine-ECU <M/T> or engine-CVT-ECU <CVT>, and measure at the equipment side.



(2) Resistance at A-08 engine-ECU <M/T> or engine-CVT-ECU <CVT> connector terminal Nos.105 and 106

OK: 120 ± 20 Ω

Q: Is the check result normal?

YES : <Within 120 ± 20 Ω> Repair the wiring harness between combination meter connector and engine-ECU <M/T> or engine-CVT-ECU <CVT> connector.

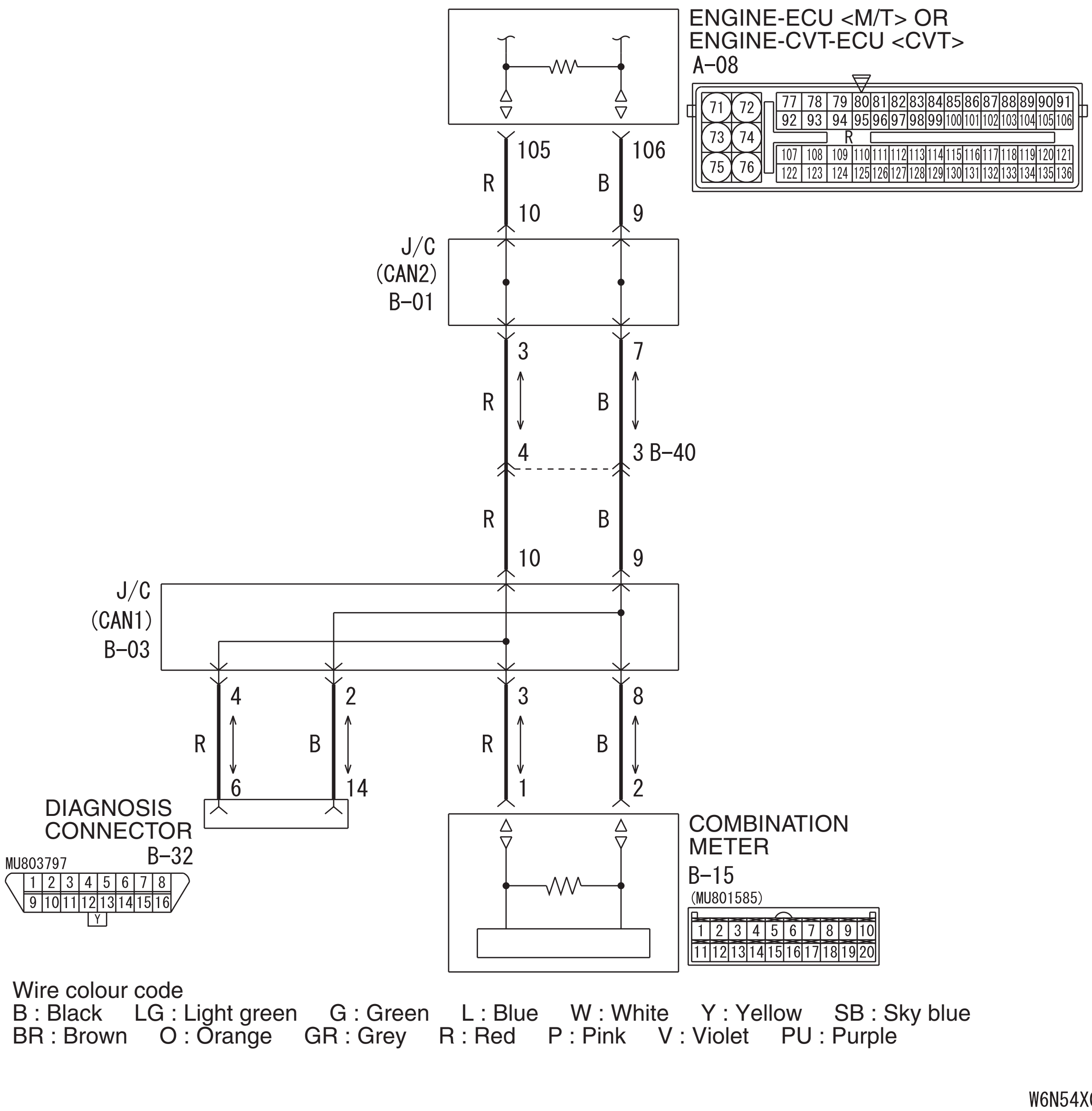
NO : <Not within 120 ± 20 Ω> Replace the engine-ECU <M/T> or engine-CVT-ECU <CVT>.

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Diagnosis Item 5: Diagnose when the M.U.T.-III cannot receive the data sent by combination meter.

⚠ CAUTION

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "Diagnose when the M.U.T.-III cannot receive the data sent by combination meter" when the M.U.T.-III checks the periodically sent data from each ECU and cannot receive the combination meter data only.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from combination meter cannot be received and sent.

PROBABLE CAUSES

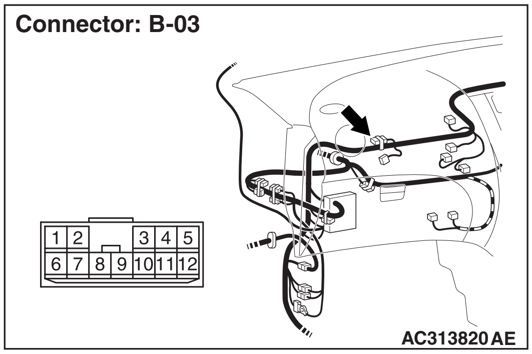
- Damaged harness wires and connectors
- Power supply circuit malfunction of the combination meter
- Malfunction of the combination meter

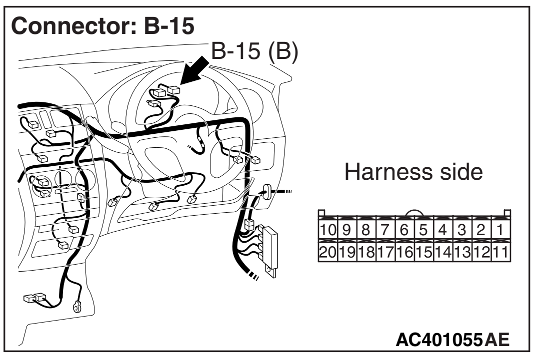
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DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-03 joint connector (CAN1) and B-15 combination meter connector

⚠ CAUTION





The strand end of the twist wire should be within 10 cm from the connector. For details refer to **P.54D-5****.**

When checking the joint connector, ensure that its wiring harness side is not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector. Replace the joint connector as necessary.

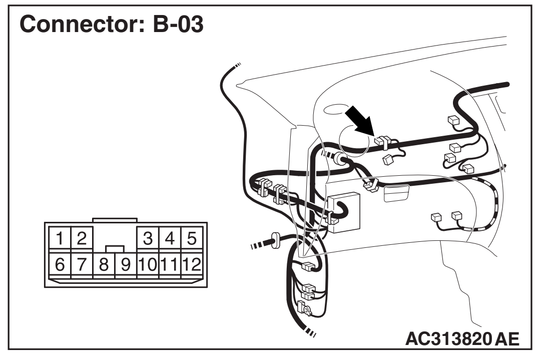
STEP 2. Resistance measurement at B-03 joint connector (CAN1) and B-15 combination meter connector.

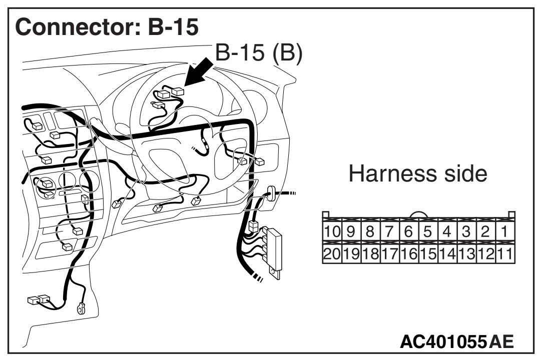
⚠ CAUTION

A digital multimeter should be used. For details refer to **P.54D-5****.**

⚠ CAUTION

The test wiring harness should be used. For details refer to **P.54D-5****.**





(1) Disconnect the joint connector (CAN1) and the combination meter connector, and measure at the wiring harness side.

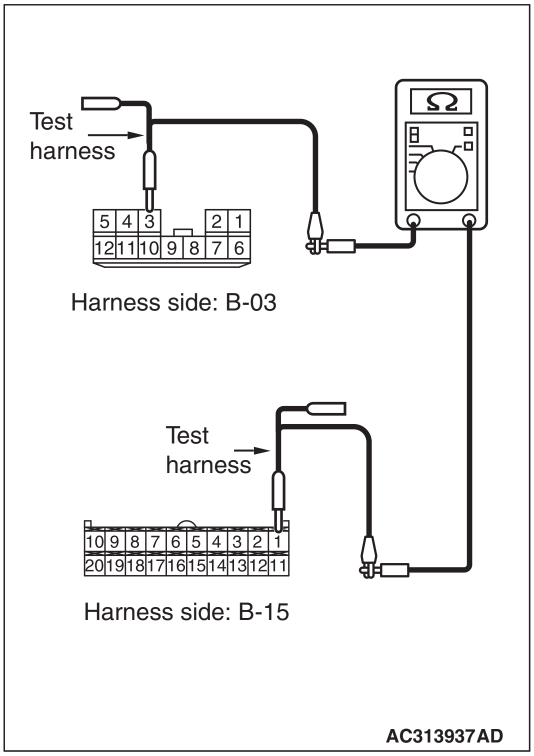
(2) Turn the ignition switch to the OFF (LOCK) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to **P.54D-5****.**

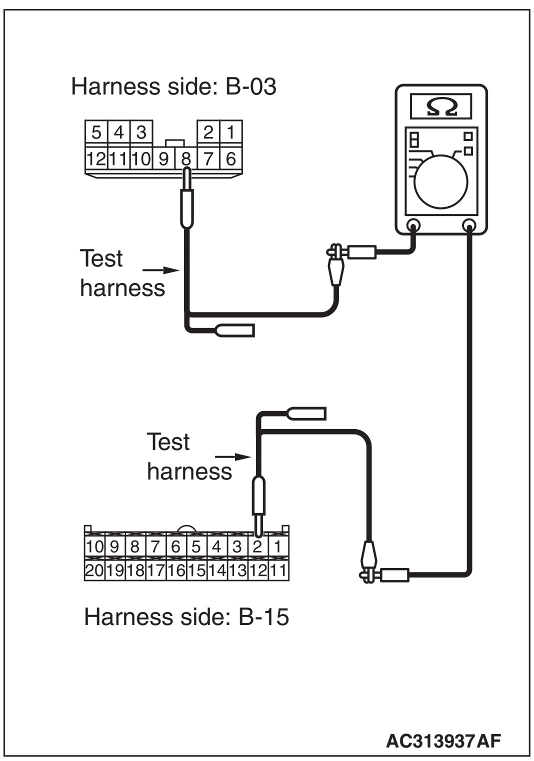
(3) Ensure that the negative battery terminal is disconnected.

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(4) Continuity between B-03 joint connector (CAN1) terminal No.3 and B-15 combination meter connector terminal No.1

OK: Continuity (2 Ω or less)



(5) Continuity between B-03 joint connector (CAN1) terminal No.8 and B-15 combination meter connector terminal No.2

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54D-5.

Q: Is the check result normal?

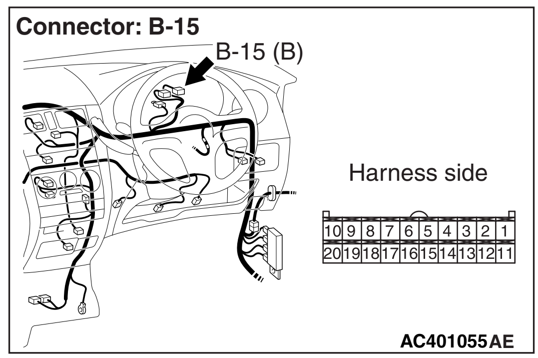
YES : <All the resistances measure 2 Ω or less> Go to Step 3.

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between joint connector (CAN1) and the combination meter connector.

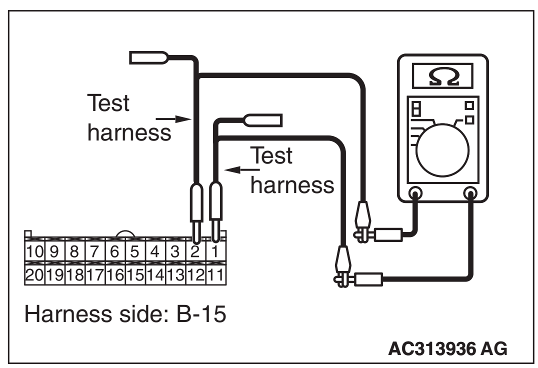
STEP 3. Resistance measurement at B-15 combination meter connector

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.



(1) Remove the combination meter, and measure at the equipment side.



(2) Resistance between B-15 combination meter connector terminal Nos.1 and 2

OK: 120 ± 20 Ω

Q: Is the check result normal?

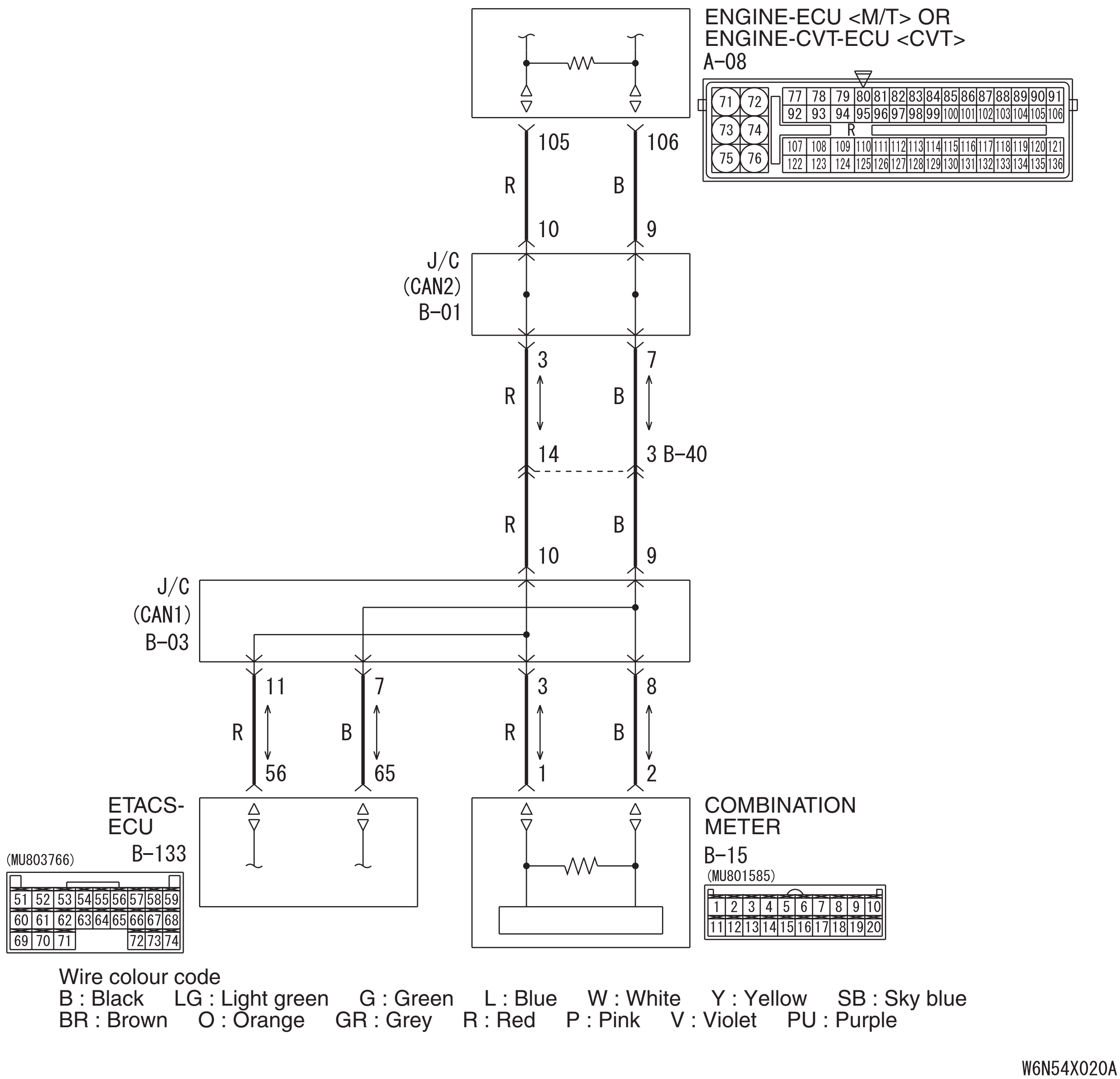
YES : <120 ± 20 within Ω> Power supply to the combination meter may be suspected. Diagnose the combination meter. Refer to GROUP 54A – Troubleshooting P.54A-44.

NO : <120 ± 20 not within Ω> Replace the combination meter.

Diagnosis Item 6: Diagnose when the M.U.T.-III cannot receive the data sent by ETACS-ECU.

⚠ CAUTION

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "the M.U.T.-III cannot receive the sent data from the ETACS-ECU" when the M.U.T.-III checks the periodically sent data from each ECU and cannot receive the ETACS-ECU data only.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from ETACS-ECU cannot be received and sent.

PROBABLE CAUSES

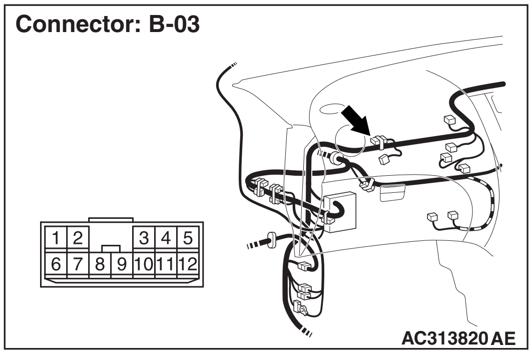
- Damaged harness wires and connectors
- Power supply circuit malfunction of the ETACS-ECU
- Malfunction of the ETACS-ECU

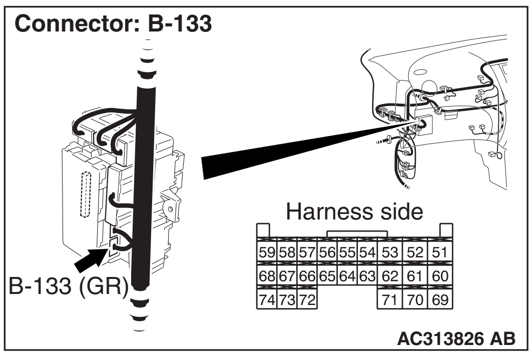
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DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-03 joint connector (CAN1) and B-133 ETACS-ECU connector

⚠ CAUTION





The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54D-5.

When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector. Replace the joint connector as necessary.

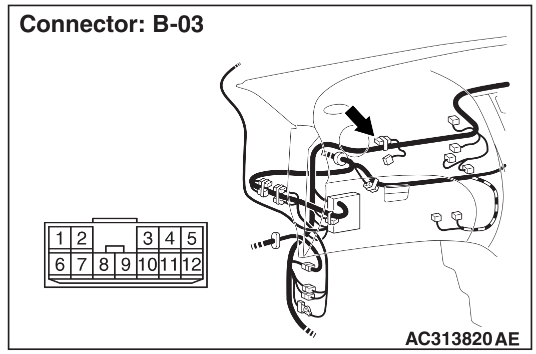
STEP 2. Resistance measurement at B-03 joint connector (CAN1) and B-133 ETACS-ECU connector.

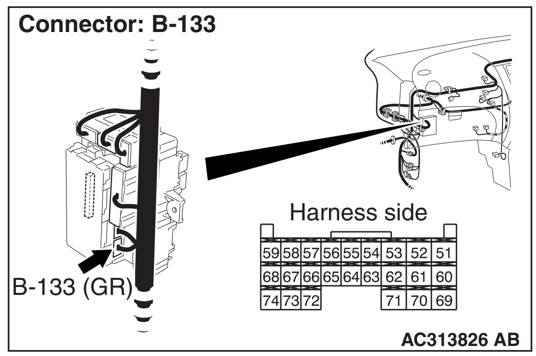
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.





(1) Disconnect the joint connector (CAN1) and the ETACS-ECU connector, and measure at the wiring harness side.

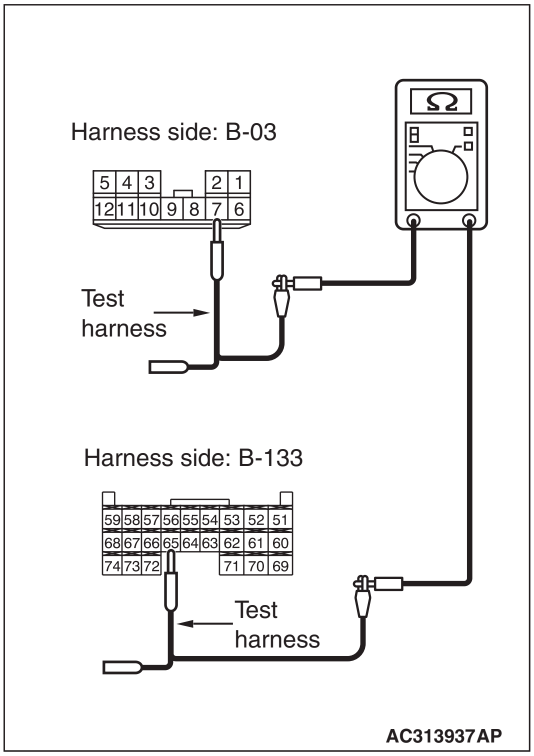
(2) Turn the ignition switch to the OFF (LOCK) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

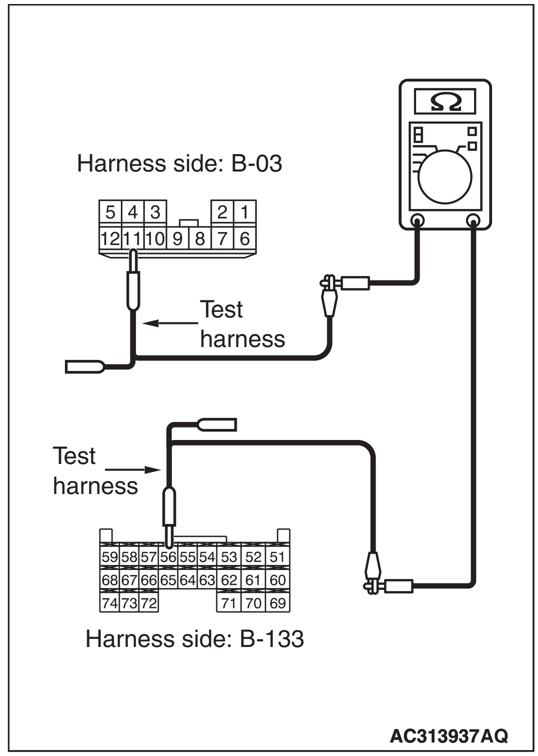
(3) Ensure that the negative battery terminal is disconnected.

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(4) Continuity between B-03 joint connector (CAN1) terminal No.7 and B-133 ETACS-ECU connector terminal No.65

OK: Continuity (2 Ω or less)



(5) Continuity between B-03 joint connector (CAN1) terminal No.11 and B-133 ETACS-ECU connector terminal No.56

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54D-5.

Q: Is the check result normal?

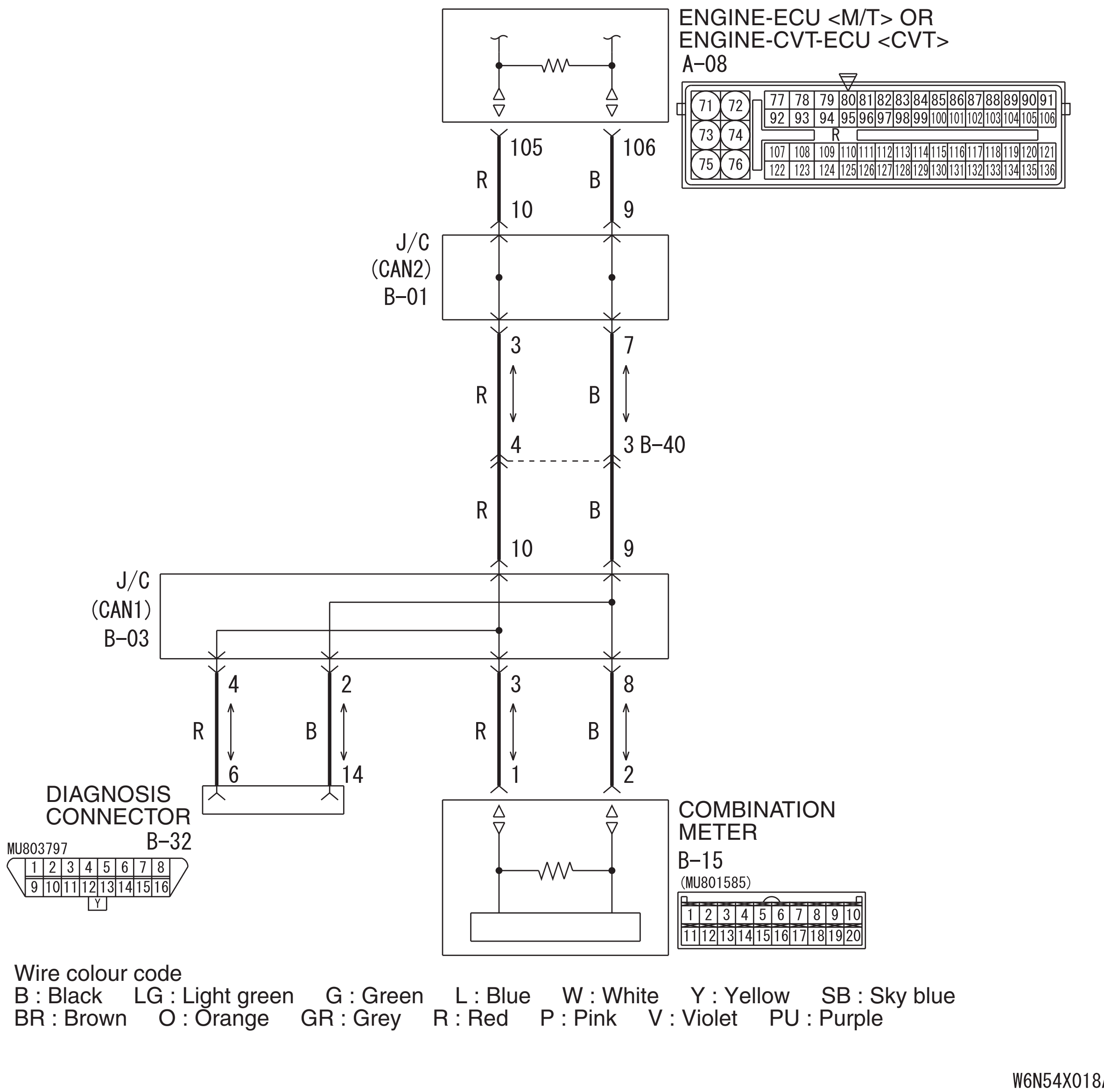
YES : <All the resistances measure 2 Ω or less> Power supply to the ETACS-ECU may be suspected. Diagnose the SWS. Refer to GROUP 54B – Troubleshooting P.54B-43.

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between joint connector (CAN1) and the ETACS-ECU connector.

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Diagnostic Item 7: Diagnose the lines between the joint connectors (CAN1 and CAN2).

⚠ **CAUTION**
When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "diagnose the lines between the joint connectors (CAN1 and CAN2)" when the M.U.T.-III checks the periodically sent data from each ECU and cannot receive the engine-A/T-ECU, the ABS-ECU, the A/C-ECU and the SRS-ECU data.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from EPS-ECU, G and yaw rate sensor <vehicles with ASC>, ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> and the engine-ECU <M/T> or engine-CVT-ECU <CVT> cannot be received and sent.

PROBABLE CAUSE

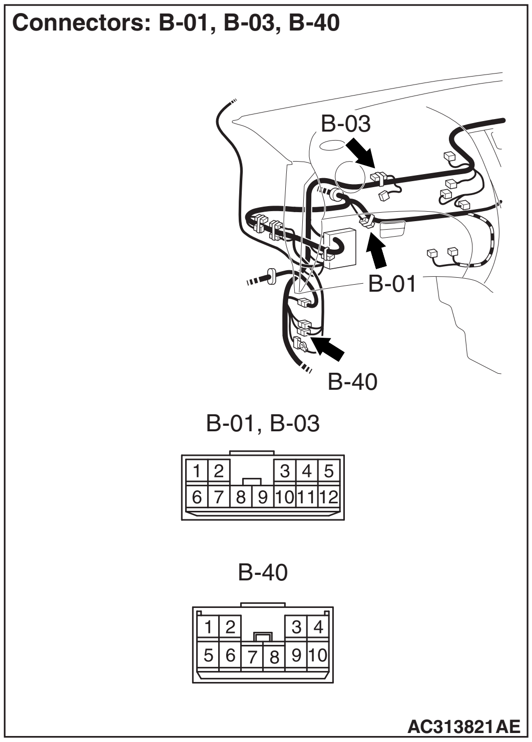
Damaged harness wires and connectors

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DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-40 intermediate connector, B-01 joint connector (CAN2) and B-03 joint connector (CAN1)

⚠ CAUTION



The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54D-5.

When checking the joint connector, ensure that its wiring harness side is not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector. Replace the joint connector as necessary.

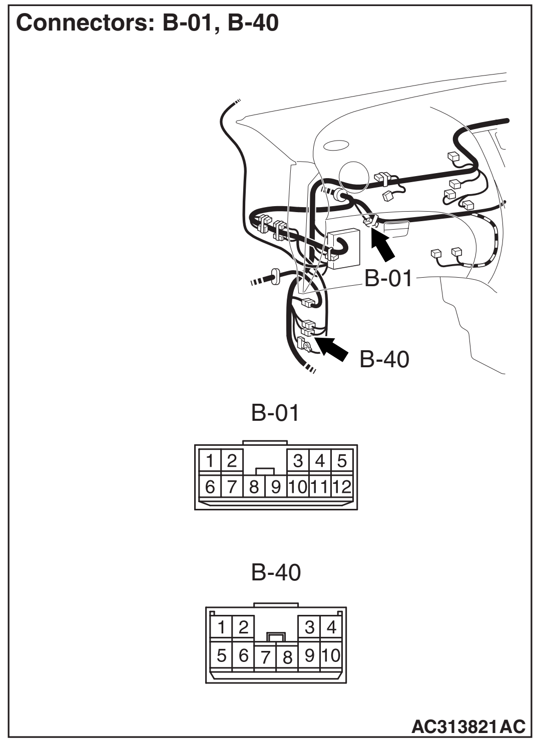
STEP 2. Resistance measurement at B-01 joint connector (CAN2) and B-40 intermediate connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.



(1) Disconnect the joint connector (CAN2) and the intermediate connector, and measure at the wiring harness side.

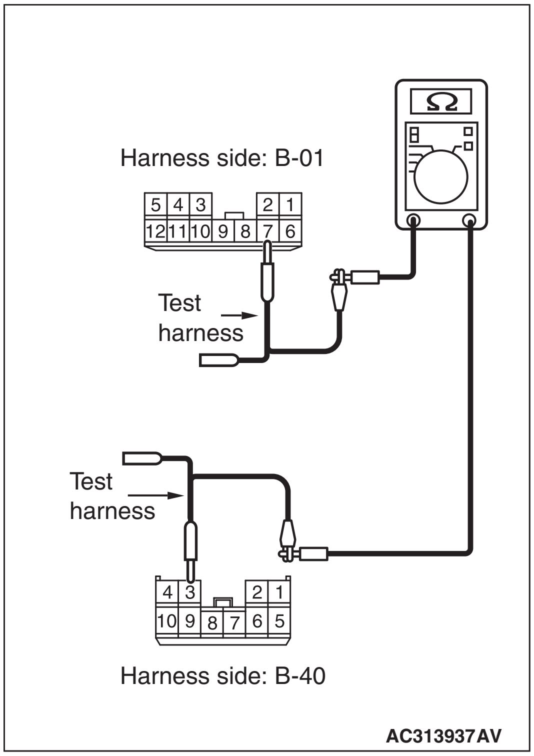
(2) Turn the ignition switch to the OFF (LOCK) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

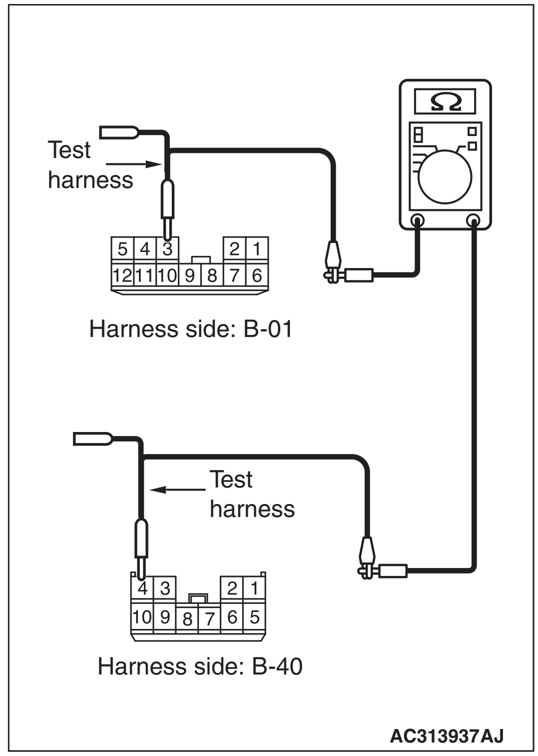
(3) Ensure that the negative battery terminal is disconnected.

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(4) Continuity between B-40 intermediate connector terminal No.3 and B-01 joint connector (CAN2) terminal No.7

OK: Continuity (2 Ω or less)



(5) Continuity between B-40 intermediate connector terminal No.4 and B-01 joint connector (CAN2) terminal No.3

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54D-5.

Q: Is the check result normal?

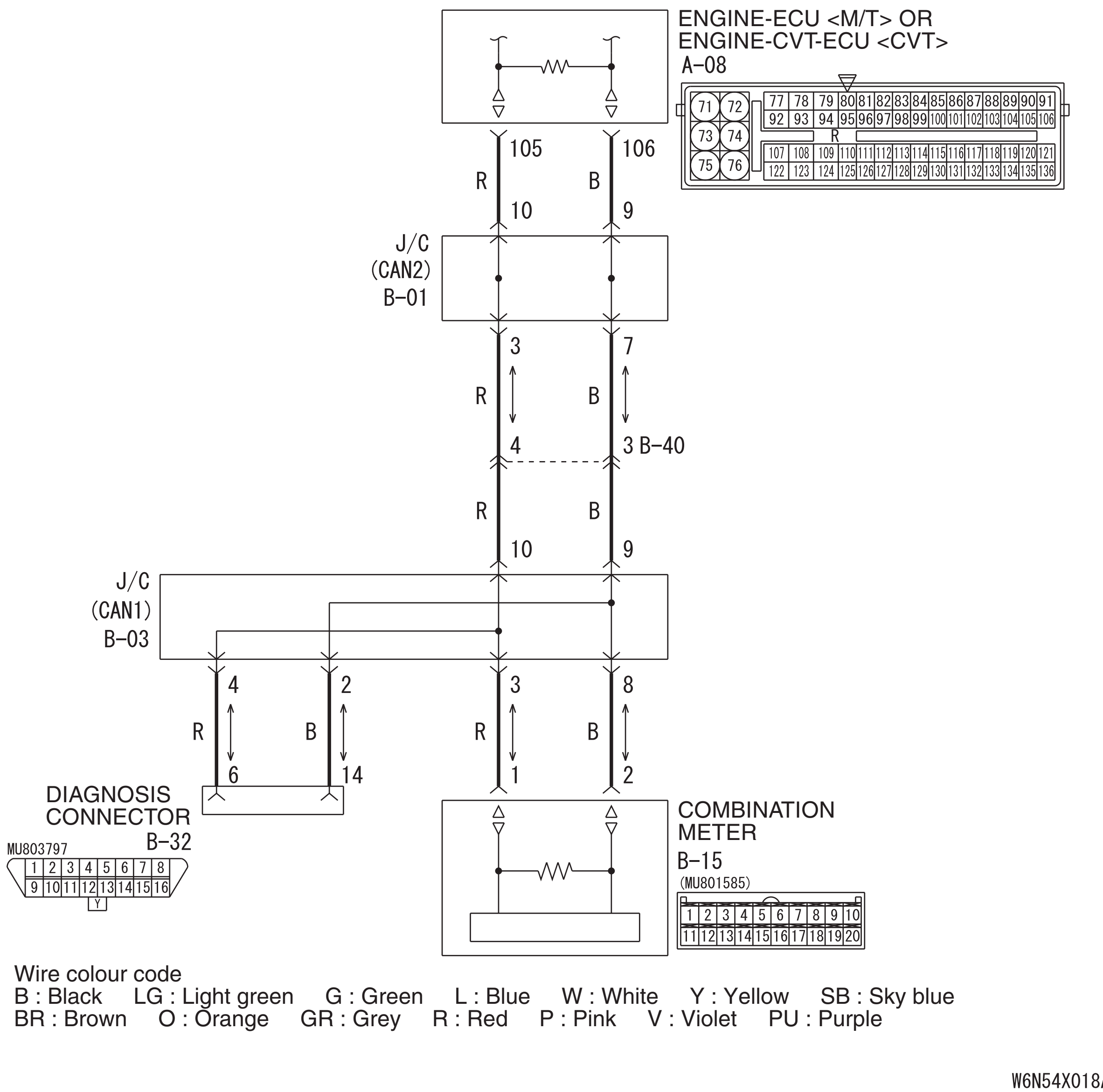
YES : <All the resistances measure 2 Ω or less> Follow diagnosis item 5, 6, 8, 9, 10, 11 and 12. Refer to P.54D-13.

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between joint connector (CAN1) and joint connector (CAN2).

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Diagnostic Item 8: Diagnose when the M.U.T.-III cannot receive the data sent by engine-ECU <M/T> or engine-CVT-ECU <CVT>.

⚠ CAUTION
When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "Diagnose when the M.U.T.-III cannot receive the data sent by engine-ECU <M/T> or engine-CVT-ECU <CVT>" when the M.U.T.-III checks the periodically sent data from each ECU and cannot receive the engine-ECU <M/T> or engine-CVT-ECU <CVT> data only.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from engine-ECU <M/T> or engine-CVT-ECU <CVT> cannot be received and sent.

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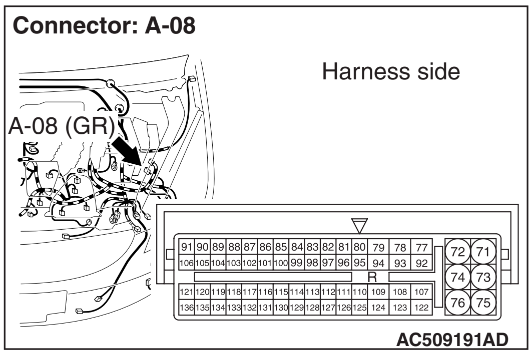
PROBABLE CAUSES

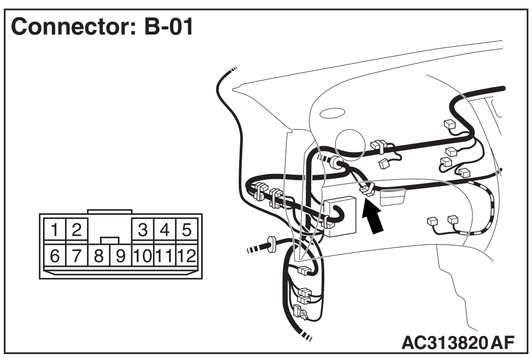
- Damaged harness wires and connectors
- Power supply circuit malfunction of the engine-A/T-ECU
- Malfunction of the engine-ECU <M/T> or engine-CVT-ECU <CVT>

DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-01 joint connector (CAN2) and A-08 engine-ECU <M/T> or engine-CVT-ECU <CVT> connector

⚠ **CAUTION**





The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54D-5.

When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector. Replace the joint connector as necessary.

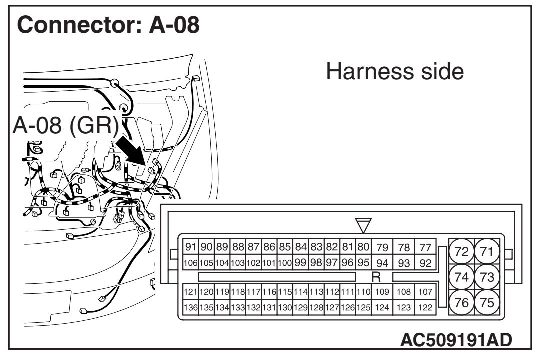
STEP 2. Resistance measurement at B-01 joint connector (CAN2) and A-08 engine-ECU <M/T> or engine-CVT-ECU <CVT> connector.

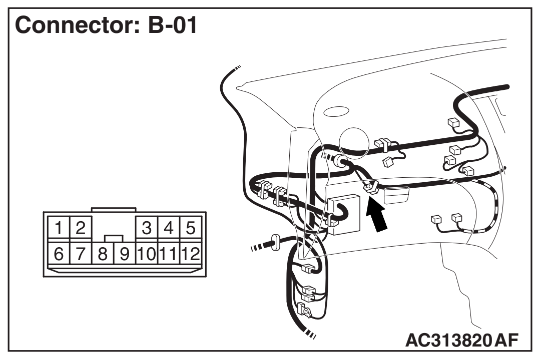
⚠ **CAUTION**

A digital multimeter should be used. For details refer to P.54D-5.

⚠ **CAUTION**

The test wiring harness should be used. For details refer to P.54D-5.





(1) Disconnect the joint connector (CAN2) and the engine-ECU <M/T> or engine-CVT-ECU <CVT> connector, and measure at the wiring harness side.

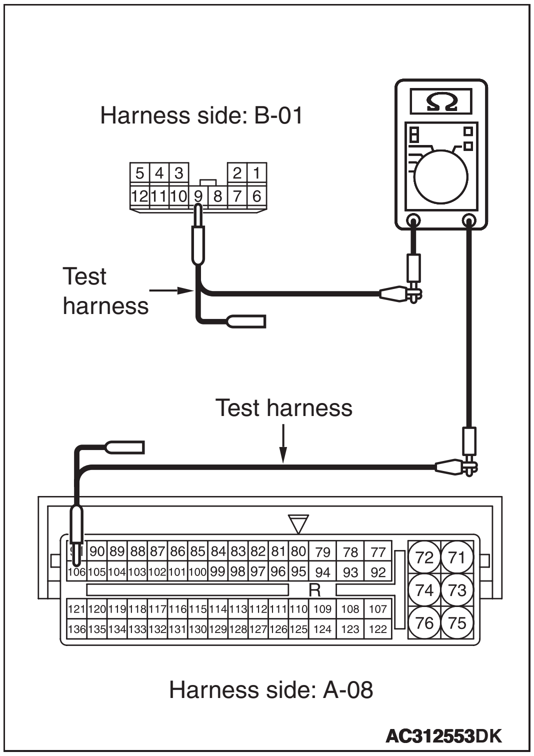
(2) Turn the ignition switch to the OFF (LOCK) position.

⚠ **CAUTION**

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

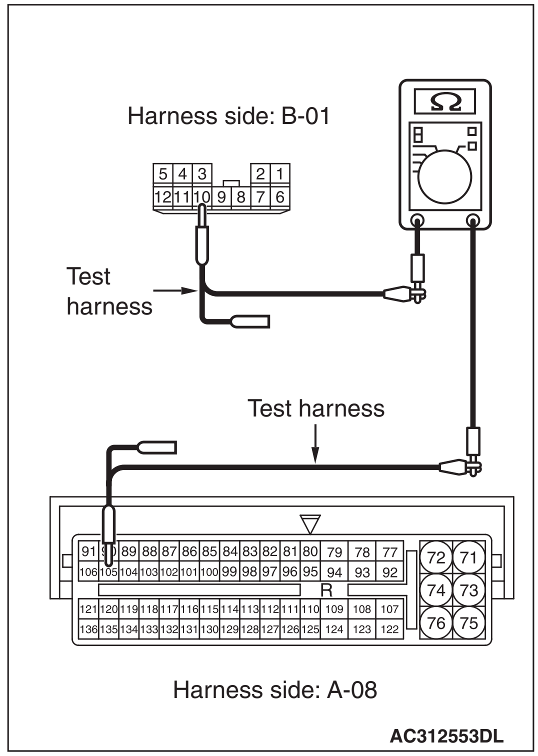
(3) Ensure that the negative battery terminal is disconnected.

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(4) Continuity between B-01 joint connector (CAN2) terminal No.9 and A-08 engine-ECU <M/T> or engine-CVT-ECU <CVT> connector terminal No.106

OK: Continuity (2 Ω or less)



(5) Continuity between B-01 joint connector (CAN2) terminal No.10 and A-08 engine-ECU <M/T> or engine-CVT-ECU <CVT> connector terminal No.105

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54D-5.

Q: Is the check result normal?

YES : <All the resistances measure 2 Ω or less> Go to Step 3.

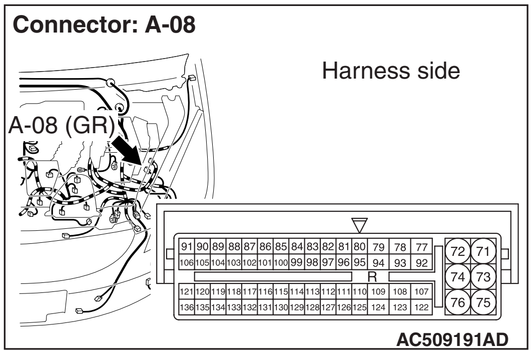
NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between the joint connector (CAN2) and the engine-ECU <M/T> or engine-CVT-ECU <CVT> connector.

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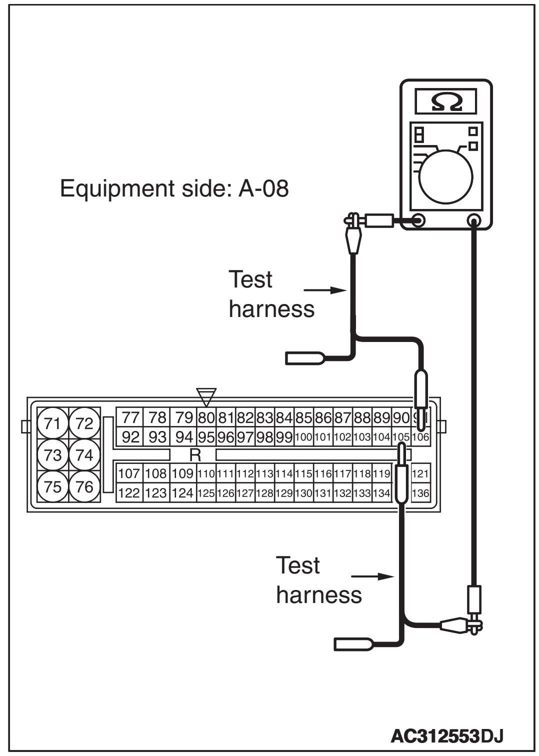
STEP 3. Resistance measurement at A-08 engine-ECU <M/T> or engine-CVT-ECU <CVT> connector

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.



(1) Remove the engine-ECU <M/T> or engine-CVT-ECU <CVT>, and measure at the equipment side.



(2) Resistance at A-08 engine-ECU <M/T> or engine-CVT-ECU <CVT> connector terminal Nos.105 and 106

OK: 120 ± 20 Ω

Q: Is the check result normal?

YES : <Within 120 ± 20 Ω> Power supply to the engine-ECU <M/T> or engine-CVT-ECU <CVT> may be suspected. Diagnose the fuel system. Refer to GROUP 13A – Troubleshooting P.13A-281 <N/A> or GROUP 13B – Troubleshooting P.13B-282 <T/C>.

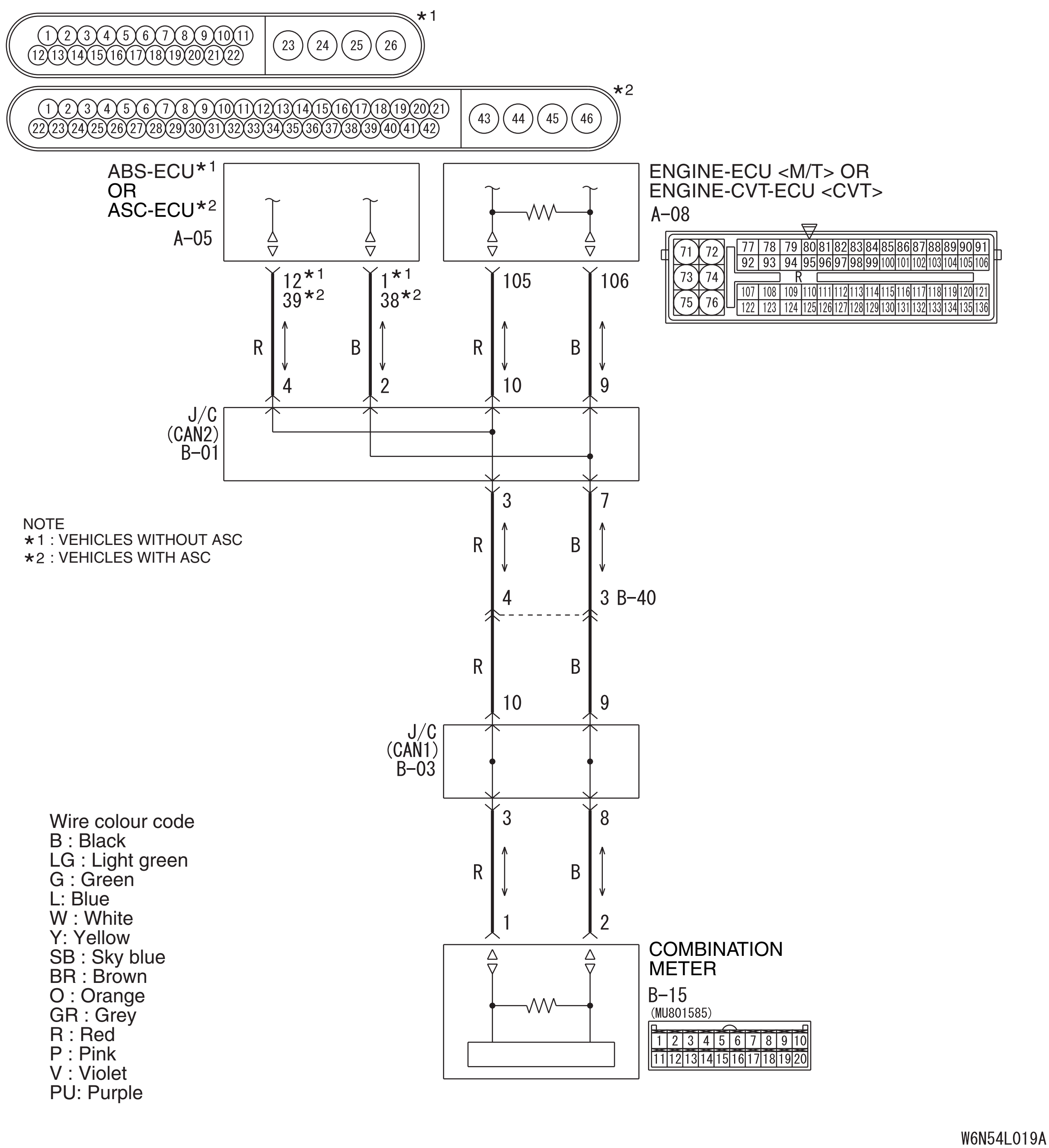
NO : <120 ± 20 Ω not within> Replace the engine-ECU <M/T> or engine-CVT-ECU <CVT>.

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Diagnostic Item 9: Diagnose when the M.U.T.-III cannot receive the data sent by ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC>.

⚠ CAUTION

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



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FUNCTION

The diagnostic result demonstrates that "Diagnose when the M.U.T.-III cannot receive the data sent by ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC>" when the M.U.T.-III checks the periodically sent data from each ECU and cannot receive the ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> data only.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> cannot be received and sent.

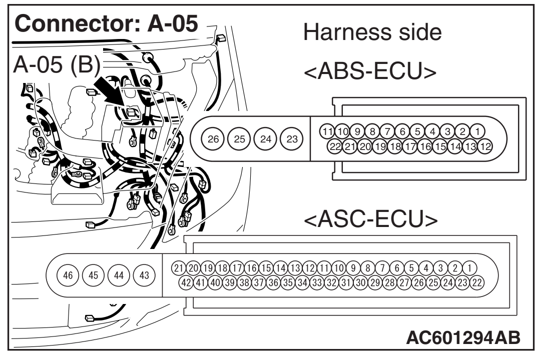
PROBABLE CAUSES

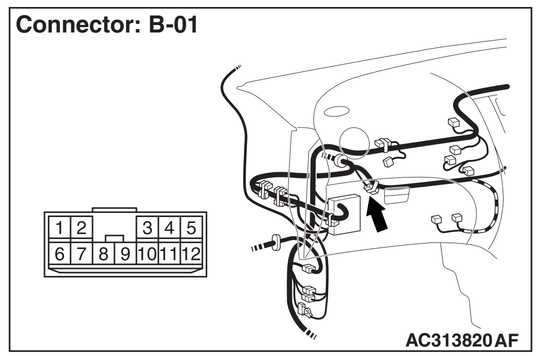
- Damaged harness wires and connectors
- Power supply circuit malfunction of the ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC>
- Malfunction of the ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC>

DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-01 joint connector (CAN2) and A-05 ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> connector

⚠ CAUTION





The strand end of the twist wire should be within 10 cm from the connector. For details refer to **P.54D-5.**

When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector. Replace the joint connector as necessary.

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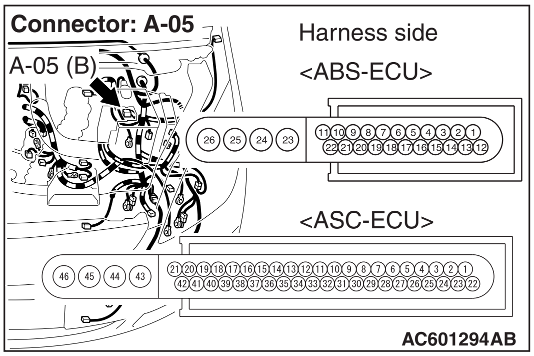
STEP 2. Resistance measurement at B-01 joint connector (CAN2) and A-05 ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> connector.

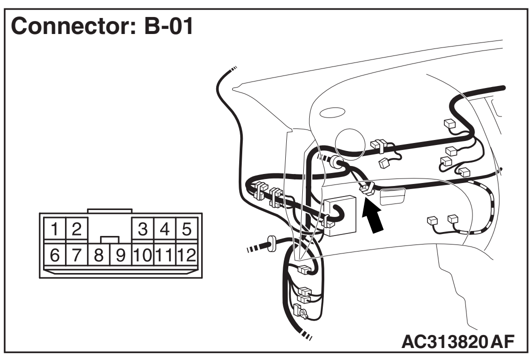
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.



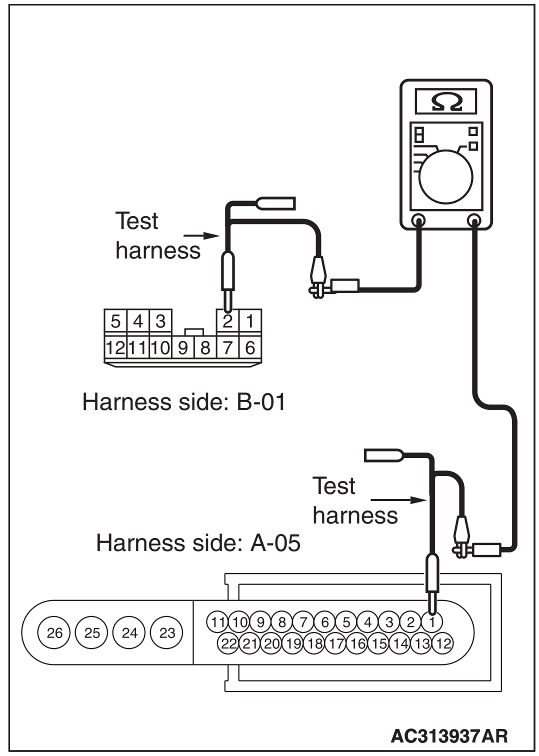


(1) Disconnect the joint connector (CAN2) and the ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the OFF (LOCK) position.

⚠ CAUTION

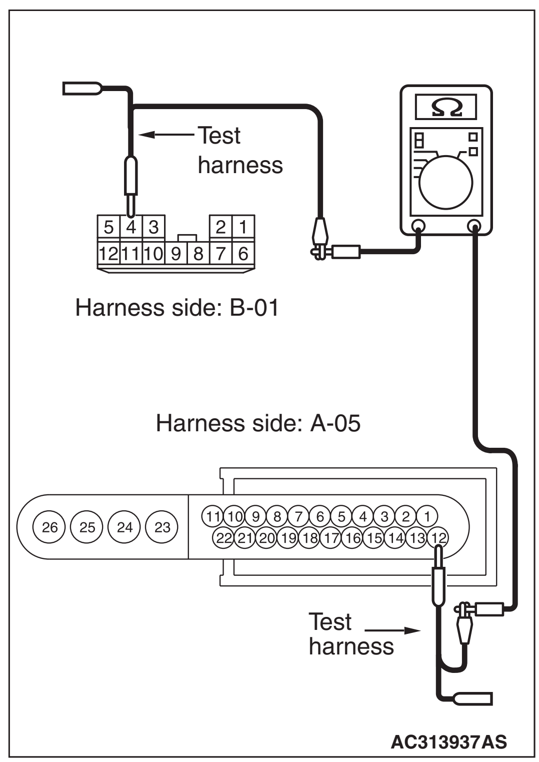
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

(3) Ensure that the negative battery terminal is disconnected.



(4) Continuity between B-01 joint connector (CAN2) terminal No.2 and A-05 ABS-ECU connector terminal No.1 <vehicles without ASC>

OK: Continuity (2 Ω or less)

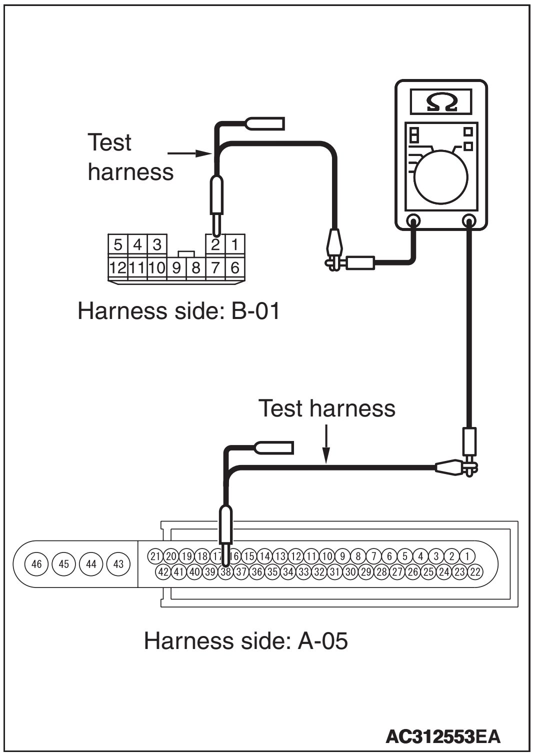


(5) Continuity between B-01 joint connector (CAN2) terminal No.4 and A-05 ABS-ECU connector terminal No.12 <vehicles without ASC>

OK: Continuity (2 Ω or less)

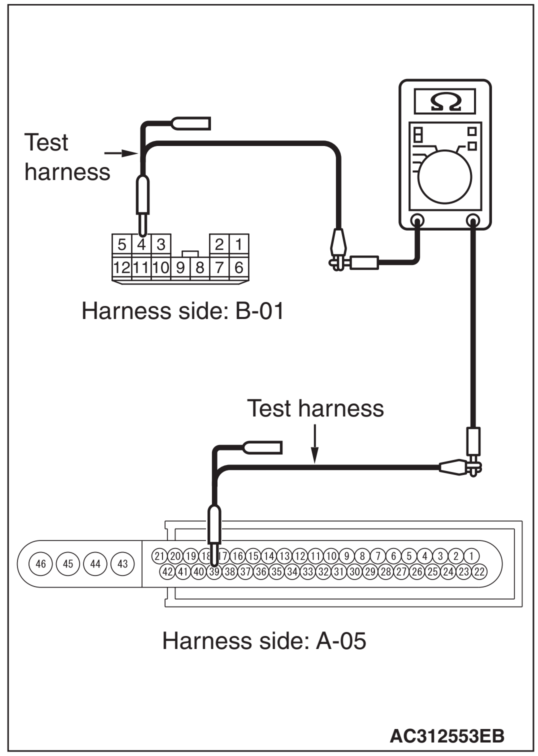
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⚠ CAUTION
Strictly observe the specified wiring harness repair procedure. For details refer to P.54D-5.



(6) Continuity between B-01 joint connector (CAN2) terminal No.2 and A-05 ASC-ECU connector terminal No.38 <vehicles with ASC>

OK: Continuity (2 Ω or less)



(7) Continuity between B-01 joint connector (CAN2) terminal No.4 and A-05 ASC-ECU connector terminal No.39 <vehicles with ASC>

OK: Continuity (2 Ω or less)

⚠ CAUTION
Strictly observe the specified wiring harness repair procedure. For details refer to P.54D-5.

Q: Is the check result normal?

YES : <All the resistances measure 2 Ω or less> Power supply to the ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> may be suspected. Diagnose the ABS or ASC system. Refer to GROUP 35B – Troubleshooting P.35B-60 <vehicles without ASC> or GROUP 35C – Troubleshooting P.35C-86 <vehicles with ASC>.

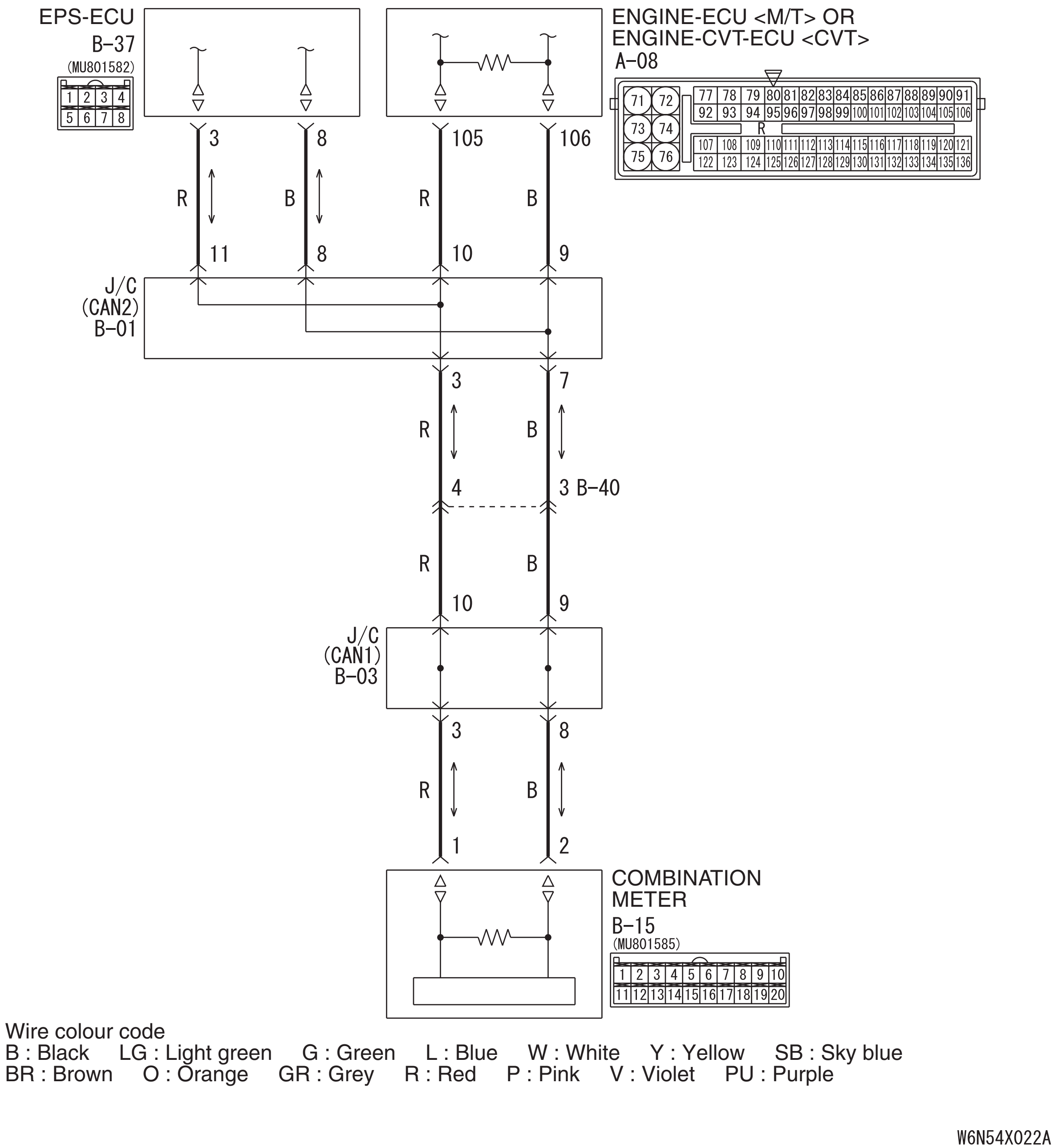
NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between the joint connector (CAN2) and the ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> connector.

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Diagnostic Item 10: Diagnose when the M.U.T.-III cannot receive the data sent by EPS-ECU.

⚠ **CAUTION**

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "Diagnose when the M.U.T.-III cannot receive the data sent by EPS-ECU" when the M.U.T.-III checks the periodically sent data from each ECU and cannot receive the EPS-ECU data only.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from EPS-ECU cannot be received and sent.

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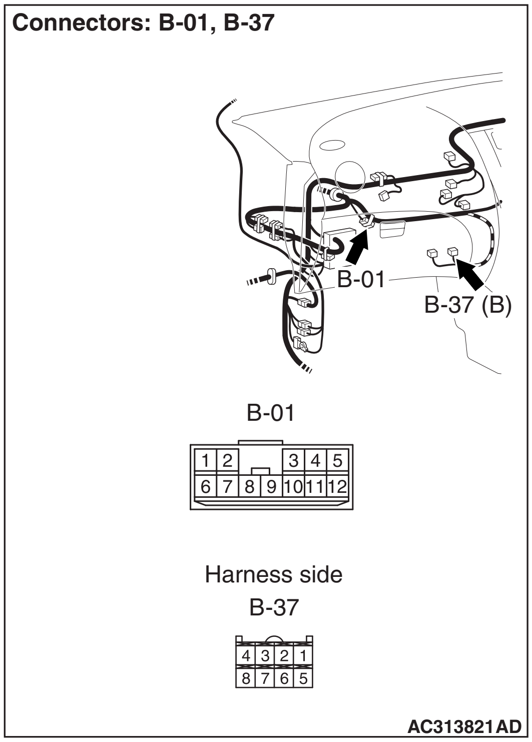
PROBABLE CAUSES

- Damaged harness wires and connectors
- Power supply circuit malfunction of the EPS-ECU
- Malfunction of the EPS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-01 joint connector (CAN2) and B-37 EPS-ECU connector

⚠ CAUTION



The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54D-5.

When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector. Replace the joint connector as necessary.

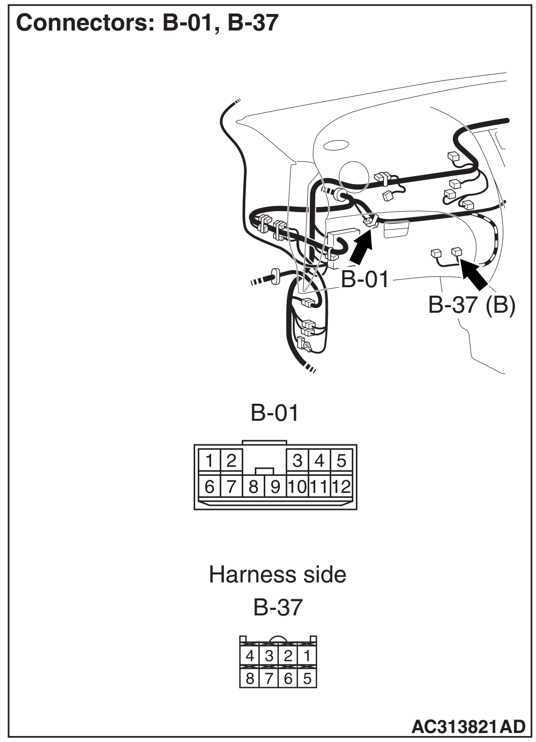
STEP 2. Resistance measurement at B-01 joint connector (CAN2) and B-37 EPS-ECU connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.



(1) Disconnect the joint connector (CAN2) and the EPS-ECU connector, and measure at the wiring harness side.

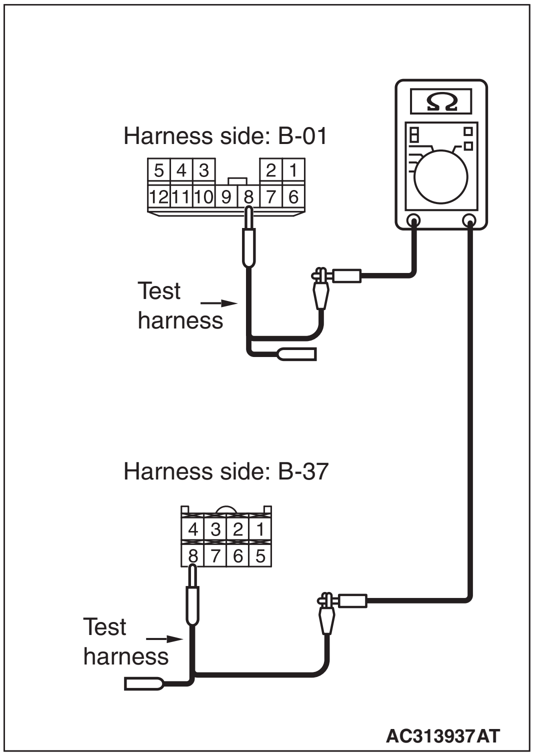
(2) Turn the ignition switch to the OFF (LOCK) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

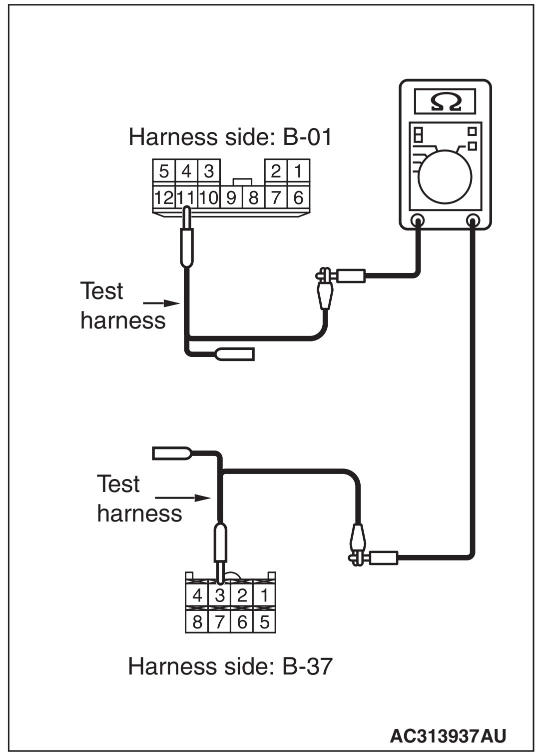
(3) Ensure that the negative battery terminal is disconnected.

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(4) Continuity between B-01 joint connector (CAN2) terminal No.8 and B-37 EPS-ECU connector terminal No.8

OK: Continuity (2 Ω or less)



(5) Continuity between B-01 joint connector (CAN2) terminal No.11 and B-37 EPS-ECU connector terminal No.3

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54D-5.

Q: Is the check result normal?

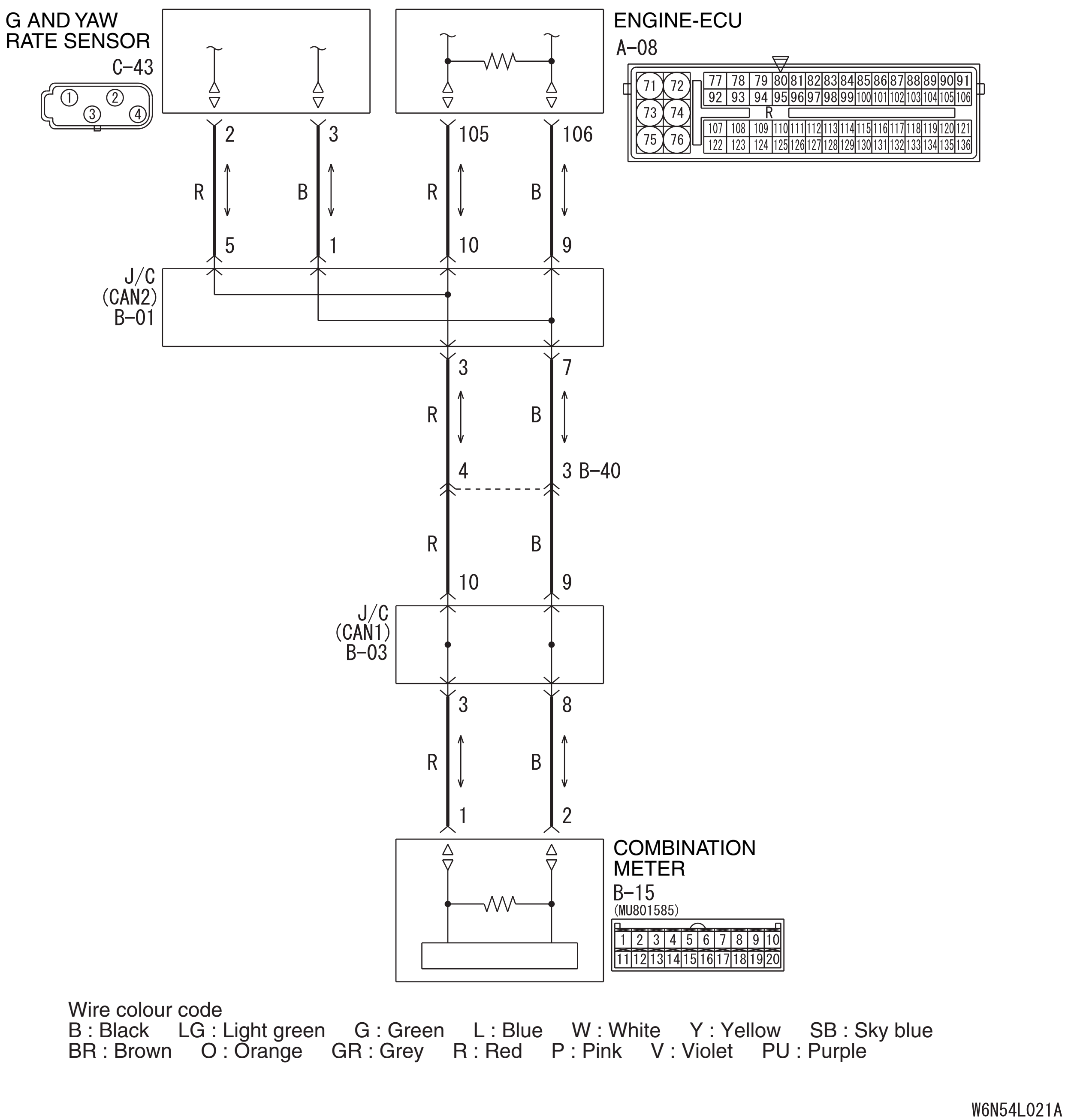
YES : <All the resistances measure 2 Ω or less> Power supply to the EPS-ECU may be suspected. Diagnose the EPS. Refer to GROUP 37 – Troubleshooting P.37-72.

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between the joint connector (CAN2) and the EPS-ECU connector.

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Diagnostic Item 11: Diagnose when the M.U.T.-III cannot receive the data sent by G and yaw rate sensor.

⚠ CAUTION
When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "Diagnose when the M.U.T.-III cannot receive the data sent by G and yaw rate sensor" when the M.U.T.-III checks the periodically sent data from each ECU and cannot receive the G and yaw rate sensor data only.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from G and yaw rate sensor cannot be received and sent.

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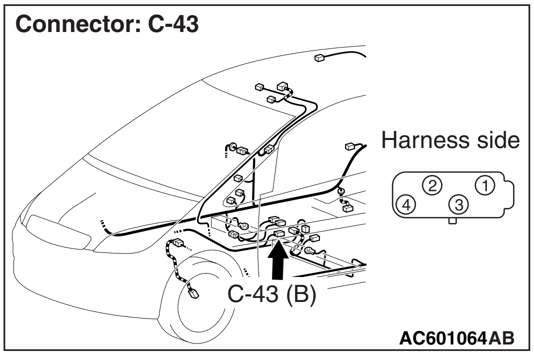
PROBABLE CAUSES

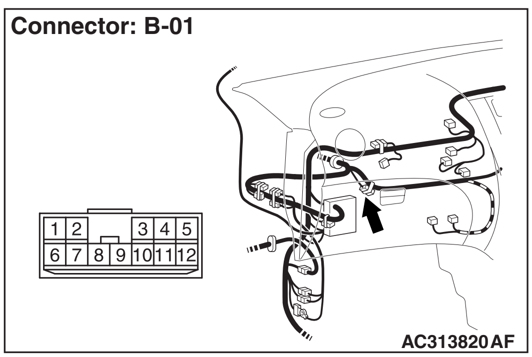
- Damaged harness wires and connectors
- Power supply circuit malfunction of the G and yaw rate sensor
- Malfunction of the G and yaw rate sensor

DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-01 joint connector (CAN2) and C-43 G and yaw rate sensor connector

⚠ CAUTION





The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54D-5.

When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair a defective connector or replace the joint connector.

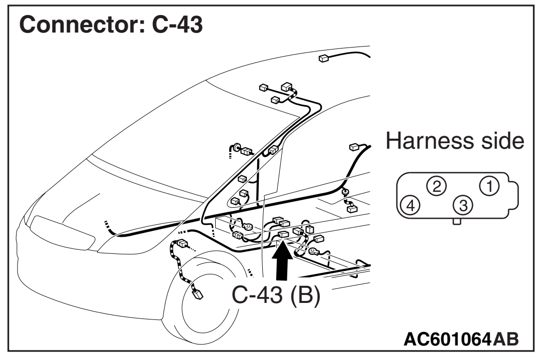
STEP 2. Resistance measurement at B-01 joint connector (CAN2) and C-43 G and yaw rate sensor connector.

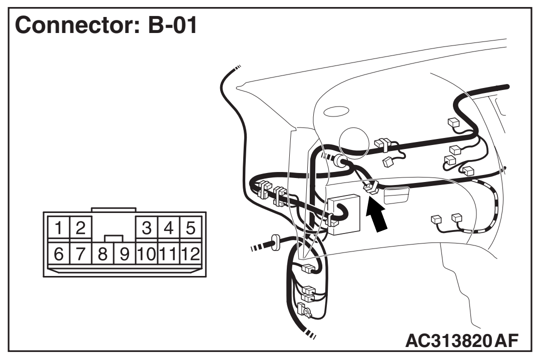
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.





(1) Disconnect the joint connector (CAN2) and the G and yaw rate sensor connector, and measure at the wiring harness side.

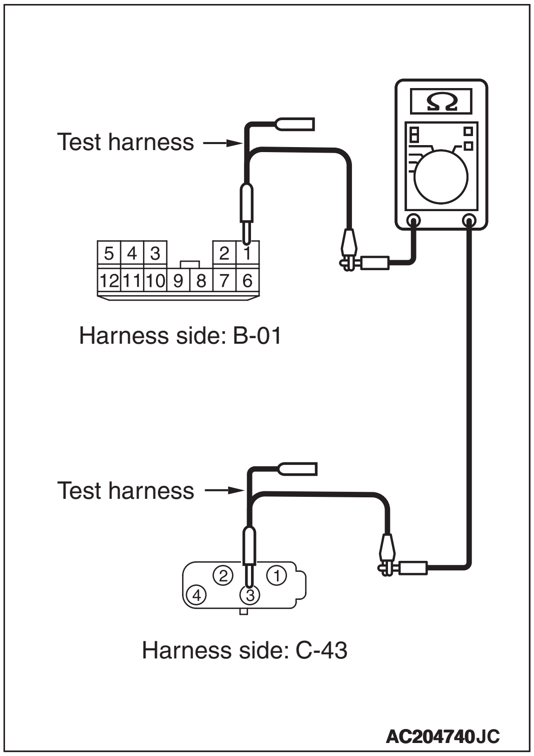
(2) Turn the ignition switch to the OFF (LOCK) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

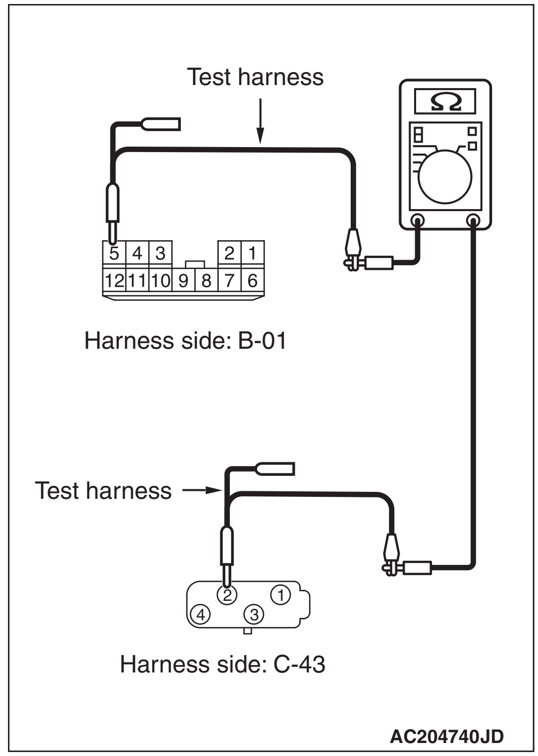
(3) Ensure that the negative battery terminal is disconnected.

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(4) Continuity between B-01 joint connector (CAN2) terminal No.1 and C-43 G and yaw rate sensor connector terminal No.3

OK: Continuity (2 Ω or less)



(5) Continuity between B-01 joint connector (CAN2) terminal No.5 and C-43 G and yaw rate sensor connector terminal No.2

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54D-5.

Q: Is the check result normal?

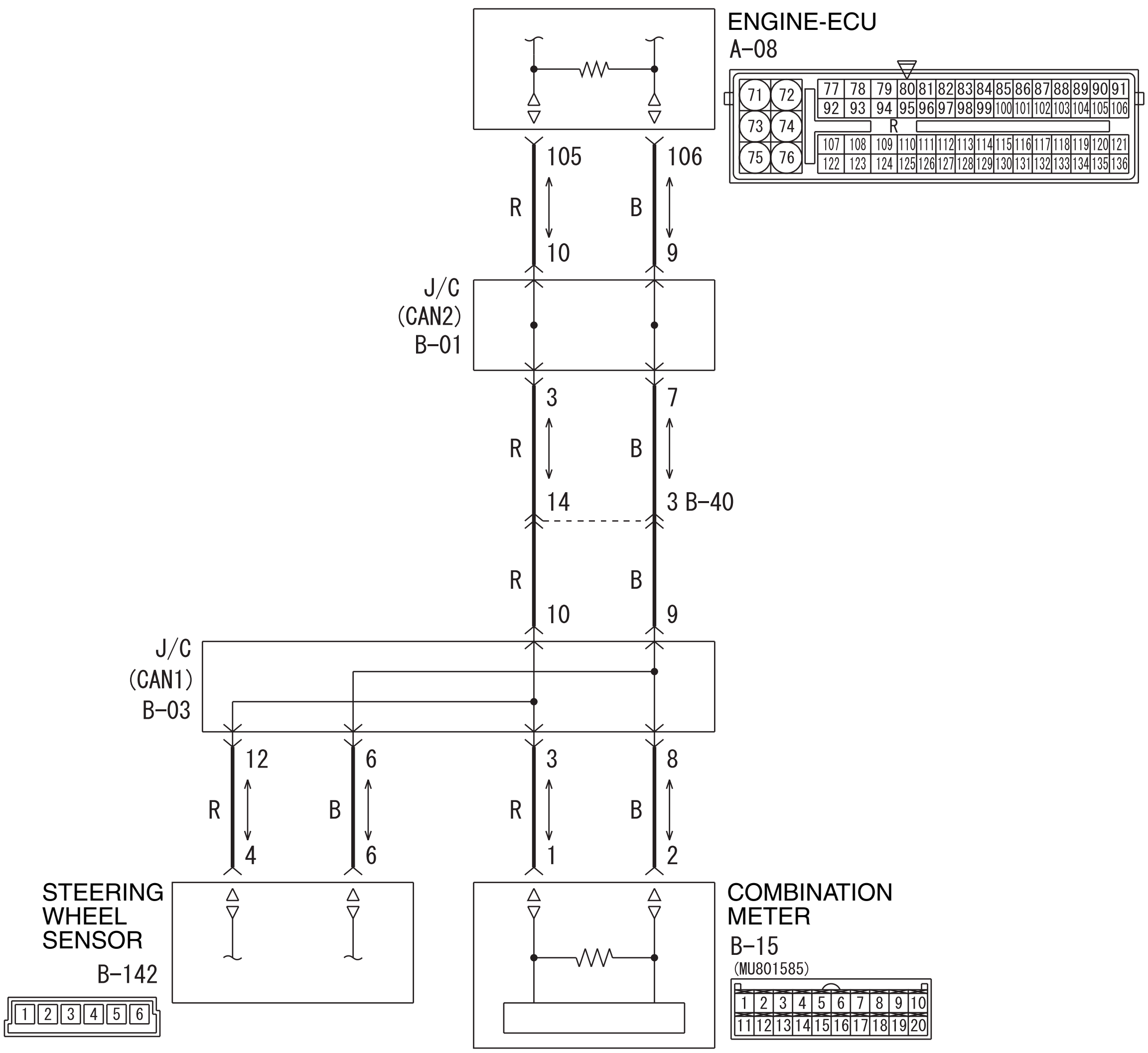
YES : <All the resistances measure 2 Ω or less> Power supply to the G and yaw rate sensor may be suspected. Diagnose the ASC system. Refer to GROUP 35C – Troubleshooting P.35C-105.

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between the joint connector (CAN2) and the G and yaw rate sensor connector.

Diagnostic Item 12: Diagnose when the M.U.T.-III cannot receive the data sent by steering wheel sensor.

⚠ CAUTION

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

W6N54L020A

FUNCTION

The diagnostic result demonstrates that "Diagnose when the M.U.T.-III cannot receive the data sent by steering wheel sensor" when the M.U.T.-III checks the periodically sent data from each ECU and cannot receive the steering wheel sensor data only.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from steering wheel sensor cannot be received and sent.

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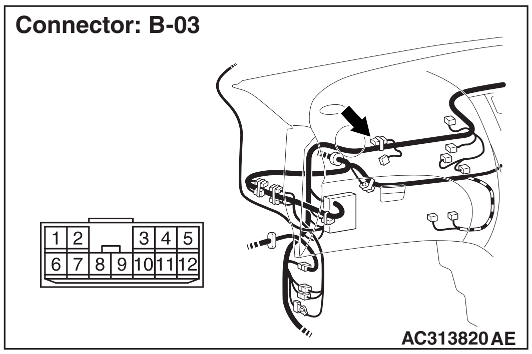
PROBABLE CAUSES

- Damaged harness wires and connectors
- Power supply circuit malfunction of the steering wheel sensor
- Malfunction of the steering wheel sensor

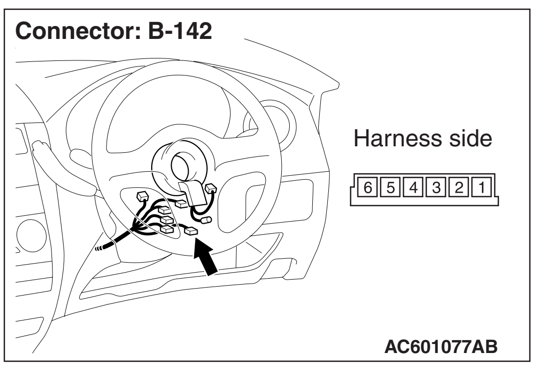
DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-03 joint connector (CAN1) and B-142 steering wheel sensor connector

⚠ CAUTION



Connector: B-03



Connector: B-142

The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54D-5.

When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector. Replace the joint connector as necessary.

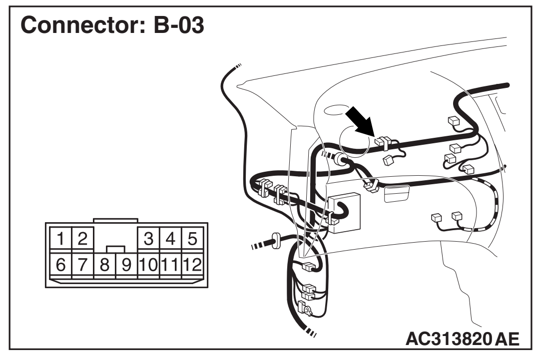
STEP 2. Resistance measurement at B-03 joint connector (CAN1) and B-142 steering wheel sensor connector.

⚠ CAUTION

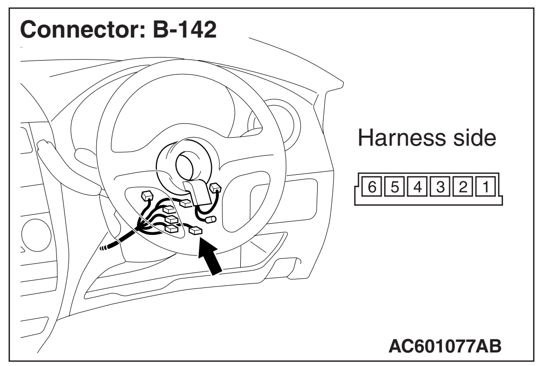
A digital multimeter should be used. For details refer to P.54D-5.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54D-5.



Connector: B-03



Connector: B-142

(1) Disconnect the joint connector (CAN1) and the steering wheel sensor connector, and measure at the wiring harness side.

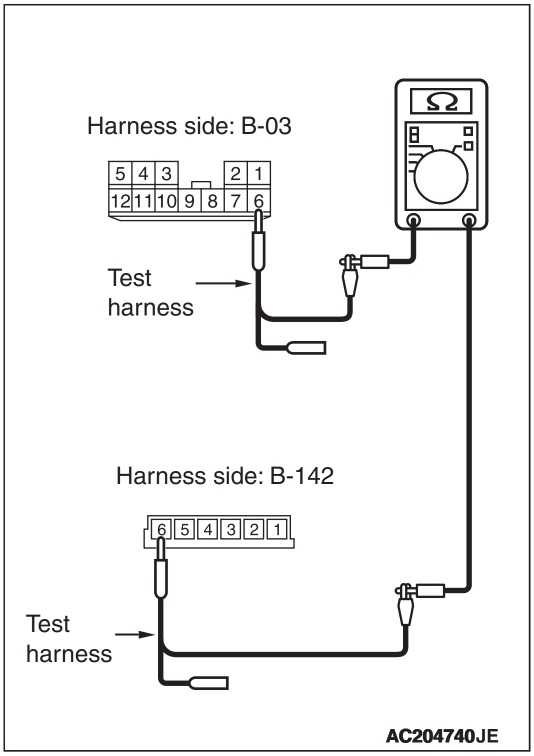
(2) Turn the ignition switch to the OFF (LOCK) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54D-5.

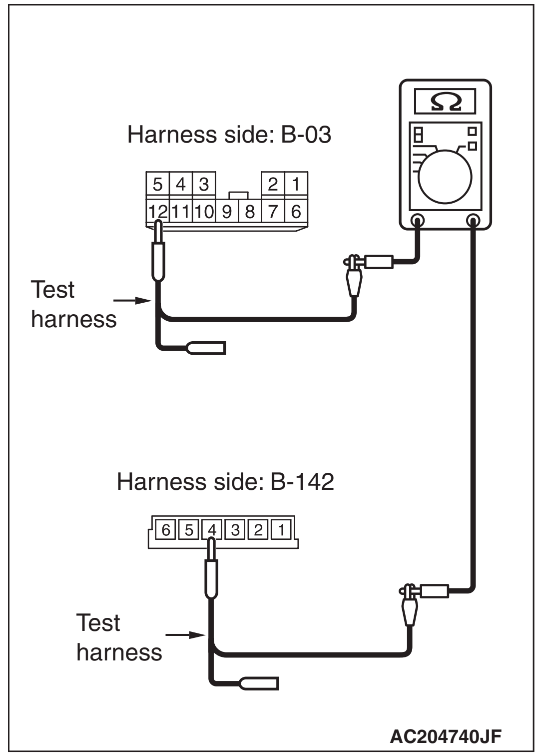
(3) Ensure that the negative battery terminal is disconnected.

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(4) Continuity between B-03 joint connector (CAN1) terminal No.6 and B-142 steering wheel sensor connector terminal No.6

OK: Continuity (2 Ω or less)



(5) Continuity between B-03 joint connector (CAN1) terminal No.12 and B-142 steering wheel sensor connector terminal No.4

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54D-5.

Q: Is the check result normal?

YES : <All the resistances measure 2 Ω or less> Power supply to the steering wheel sensor may be suspected. Diagnose the ASC system. Refer to GROUP 35C – Troubleshooting P.35C-102.

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between joint connector (CAN1) and the steering wheel sensor connector.

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CAN COMMUNICATION-RELATED DIAGNOSIS CODE (U CODE) TABLE

M1548300300450

Output ECU	Code No.	Diagnostic item	Action
Engine-ECU <M/T> or engine-CVT-ECU <CVT>	U1073	Bus Off	CAN main bus line diagnosis
	U1102	ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> time-out	
	U1106	EPS-ECU time-out	
	U1108	Meter-A/C-ECU time-out (related to meter)	
	U1110	Meter-A/C-ECU time-out (related to A/C)	
ABS-ECU <vehicles without ASC>	U1073	Bus Off	CAN main bus line diagnosis
ASC-ECU <vehicles with ASC>	U1073	Bus Off	CAN main bus line diagnosis
	U1100	engine-ECU <M/T> or engine-CVT-ECU <CVT> time-out (related to engine)	
	U1104	Steering wheel sensor time-out	
	U1105	G and yaw rate sensor time-out	
EPS-ECU	U1073	Bus Off	CAN main bus line diagnosis
	U1100	engine-ECU <M/T> or engine-CVT-ECU <CVT> time-out (related to engine)	
	U1102	ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> time-out	
	U1120	Failure information on engine-ECU <M/T> or engine-CVT-ECU <CVT> (related to engine)	Diagnose CAN main bus lines and confirm input signals.
	U1122	Failure information on ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC>	
Meter-A/C-ECU	U1073	Bus Off	CAN main bus line diagnosis
	U1100	engine-ECU <M/T> or engine-CVT-ECU <CVT> time-out (related to engine)	
	U1101	engine-ECU <M/T> or engine-CVT-ECU <CVT> time-out (related to CVT)	
	U1102	ABS-ECU <vehicles without ASC> or ASC-ECU <vehicles with ASC> time-out	
	U1106	EPS-ECU time-out	
	U1109	ETACS-ECU time-out	
	U1120	Failure information on engine-ECU <M/T> or engine-CVT-ECU <CVT> (related to engine)	Diagnose CAN main bus lines and confirm input signals.

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Output ECU	Code No.	Diagnostic item	Action
ETACS-ECU	010	Bus Off	CAN main bus line diagnosis
	011	engine-ECU <M/T> or engine-CVT-ECU <CVT> time-out (related to engine)	
	012	engine-ECU <M/T> or engine-CVT-ECU <CVT> time-out (related to CVT)	
	013	Meter-A/C-ECU time-out (related to A/C)	
	014	Meter-A/C-ECU time-out (related to meter)	
	021	Failure information on engine-ECU <M/T> or engine-CVT-ECU <CVT> (related to engine)	Diagnose CAN main bus lines and confirm input signals.